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MANAGEMENT INFORMATION SYSTEMS AND MICROCOMPUTERS IN PRIMARY HEALTH CARE

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Front Cover Photo: A concerned mother and her sick child seek help of a community health worker in the Aga Khan University's Urban Primary Health Care Programme in Karachi, Pakistan. Meeting the basic needs of women and children -- while ensuring universal coverage and equity of health care -- is a major objective of any primary health care management information system. (Photo by AKU/FHS)

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MANAGEMENT INFORMATION SYSTEMS AND MICROCOMPUTERS IN PRIMARY HEALTH CARE

Report of an international workshop

Organized and sponsored by the
Aga Khan Foundation, the Aga Khan University, and the
National School of Public Health, Ministry of Health, Portugal

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Lisbon, Portugal

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Aga Khan Foundation

1988

To all primary health care leaders, management teams, and health workers who are striving to establish and expand effective community-based health care in the face of diminishing resources for health and insufficient information for the managerial process.

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The sponsoring organizations and editors are most grateful for the substantial contributions made to the workshop and collectively to the preparation of this report by the fifty-two contributors listed on the previous page. Fifteen of these contributors worked diligently as Technical Working Group (TWG) leaders and rapporteurs and deserve special recognition for guiding the highly productive deliberations of their respective TWGs and for preparing major sections of this report. They are:

- Jack Reynolds, John Bryant, and Bazmi Inam (TWG on Community-Based Primary Health Care Management Information Systems);

- Duane Smith, Holger Hansen, and Mehtab Karim (TWG on Management Information Support for District Health Systems Based on Primary Health Care);

- Andrew Creese, Margaret Phillips, and Amina Rawji (TWG on Cost Analysis in Primary Health Care Management Information Systems);

- William Bertrand, Barbara Echols, and Khatidja Husein (TWG on Microcomputers and Alternative Data Management Techniques); and

- Alexandre Abrantes, Trygve Myhre, and Adelaide Oliveira (TWG on Microcomputers in Primary Health Care Planning and Management Decision Modeling).

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> "*The workshop is a call to human intelligence and imagination to contribute to more effective use of available financial resources for primary health care which, in Portugal, represents more than half of the national health service budget.*"

Portugal's financial commitment to primary health care demonstrates admirably its firm belief in the effectiveness of this approach, and as host of the workshop, its commitment to forge new management tools and strengthen management information systems to achieve greater efficiency of primary health care programmes.

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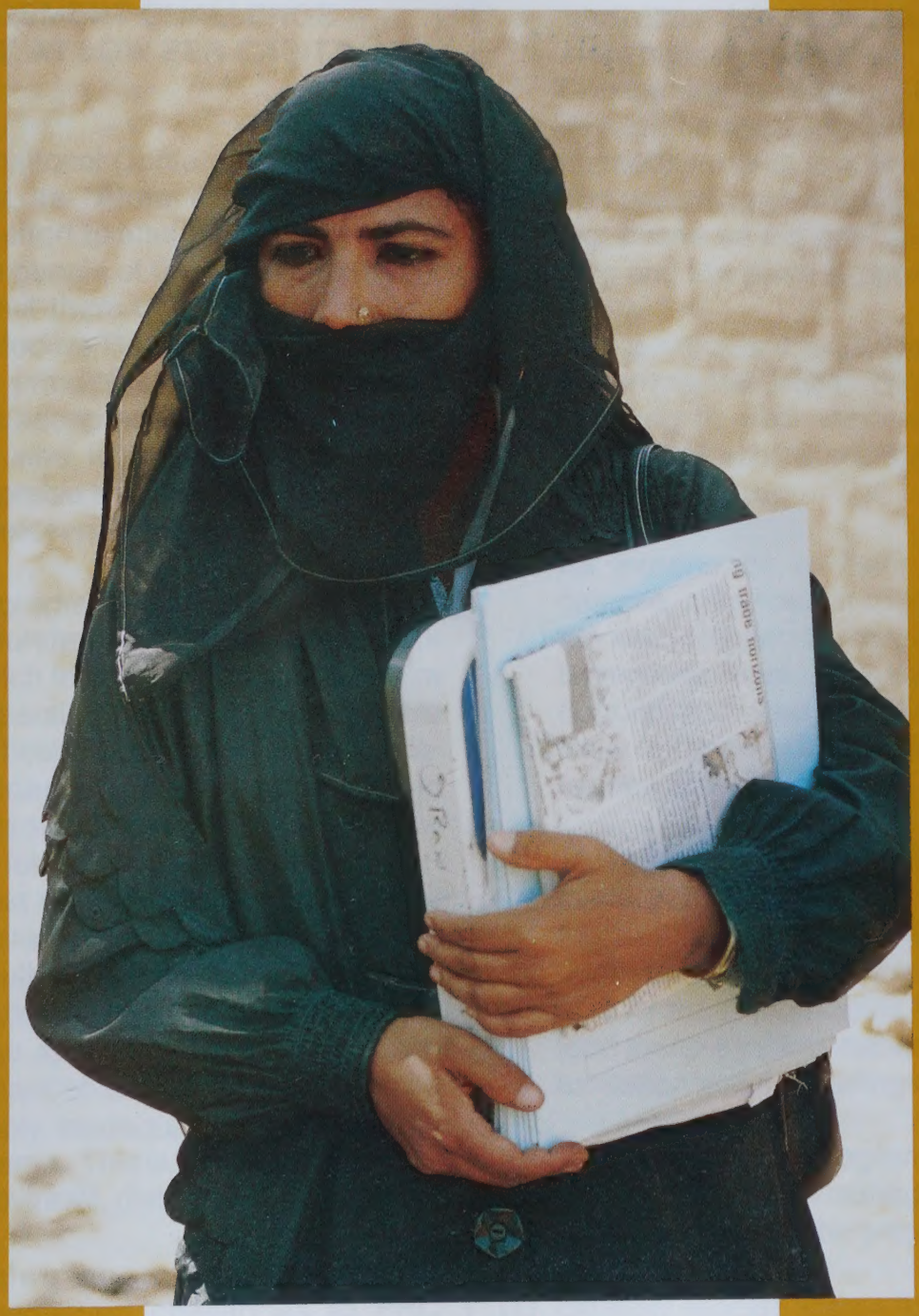
MEETING THE CHALLENGE TO IMPROVE PRIMARY HEALTH CARE

PROGRAMME MANAGEMENT AND EFFICIENCY



The cornerstone of the primary health care information system: A community health worker in Karachi, Pakistan, uses family health records to identify and help high risk women and children in the Urban Primary Health Care Programme of the Aga Khan University Faculty of Health Sciences. (Photo by AKU/FHS)

Meeting the Challenge to Improve Primary Health Care Programme Management and Efficiency

Ronald G. Wilson, Aga Khan Foundation

THE PHC MANAGEMENT CHALLENGE -- HIGH COVERAGE AT LOW PER CAPITA COST

In 1978, the International Conference on Primary Health Care and its "Alma Ata Declaration" launched a global effort to attain the goal of a level of health for all the people of the world by the year 2000 that will permit them to lead a socially and economically productive life. Primary health care (PHC), based on principles of equity, universal coverage, cultural acceptability, appropriateness and affordability, was identified as the key to achieving an acceptable level of health throughout the world in the foreseeable future.

While substantial progress has been made in the past decade, the fundamental economic and social conditions which led to the global Health For All (HFA) strategy persist. Resources for equitable provision of basic health services to large populations without access to health care remain inadequate and this situation is unlikely to improve in the foreseeable future. In many countries, particularly the poorest developing nations of Africa and Asia, per capita expenditures on health are declining as a result of serious global economic conditions, population growth and the unfortunate reality that defense spending continues to consume the "lion's share" of national budgets. Health resources are simply inadequate to address the major health problems. This is true at nearly every level -- national, provincial, district and community.

Despite worsening economic and social conditions and persisting challenges to PHC programme planners and managers, the global PHC movement is making notable progress:

* Governments around the world have endorsed (if not fully embraced) the global HFA strategy and made commitments in principle to the PHC approach;

* Large numbers of community health workers CHWs, traditional birth attendants (TBAs), and other community-level health workers have been trained;

* Community participation in local health and development activities has increased and new methods for planning, managing, monitoring and evaluating local health activities are evolving, based on the principle "bottom-up planning and top-down support";

* Non-government organizations (NGOs) and governmental health organizations are attempting to work more closely together to avoid duplication of effort and waste of scarce health resources;

* As experience in PHC programming increases, many health organizations have felt the need to prioritize health problems and interventions more carefully, based mainly on documented need, and to "target" PHC services to those with the greatest need, mainly women and children;

* There is growing recognition of the importance of high-quality and well-selected information for more efficient management decision-making. However, accurate and reliable information remains rare and managers tend to use intuition, rather than trust faulty information and misleading data.

Primary health care programmes are bringing increasing demands on managers who now, more than ever before, must be prepared to:

(1) carefully allocate scarce financial, human and material resources to meet the priority needs of children and women;

(2) provide technical guidance to and supervision of CHWs, TBAs and other community-level health workers, in addition to conventional health workers;

(3) dialogue with community health committees and other local action groups regularly;

(4) help organize local mechanisms for financing primary health care; and

(5) plan programmes with NGOs, government health services and other sectors which influence health at the local level.

To be effective, PHC programme managers must be well informed and take **informed** management decisions, being fully cognizant of constantly changing health conditions, health status of the local population, environmental health risks, priorities for health actions, service coverage, and the effects and outcomes of local health care activities and interventions. The health manager must also be well informed about the constantly changing status of health resources and how these can be allocated best "to do more for more with less". How can the manager keep himself or herself well informed all the time? This, is a paramount management challenge.

A 1987 World Health Organization (WHO) report on "Evaluation of the Strategy for Health For All by the Year 2000, Vol.1, Global Review", which served as a basic document of the 40th session of the World Health Assembly, emphasized that:

> *"The main constraint reported by practically all countries is inadequate information for the managerial process...to provide systematic and analytical information for continuous assessment of the situation, determination of priorities, improvement of management, and evaluation... The health-for-all strategy demands an integrated managerial approach ... and also monitoring and evaluation with a view to modification or readjustment of the strategy as part of a continuous cycle.*
>
> *"The fundamental principle of the health-for-all strategy is equity -- an equal health status for people and countries, ensured by an equitable distribution of health resources... It calls for the organization and strengthening of health infrastructures on the basis of primary health care, and for health manpower policies that will not only provide training, inspire motivation and ensure equitable distribution of human resources, but will also ensure the development of managerial, technical and scientific staff to at least the critical level of competence.... The information generated by the traditional health system is in most countries quite insufficient."*

The Director-General of the World Health Organization, Dr. H. Mahler, adds his views on the above-referenced report in its preface, saying:

> *"I am inclined to remember the old adage in which the inept workman blames his tools, while the problem lies not with the tools but with his lack of capacity to make intelligent use of them. The challenge...in the remaining years until 2000 demands skillful use of the tools we now have or will have to fashion to meet our goal."*

The time has come to take a fresh look at: 1) the managerial process; 2) the information needed to manage PHC competently and efficiently, not only the type and quantity of information but its quality as well; and 3) the management information systems necessary to support PHC, including both the "tools" employed and, most important, our capacity to make intelligent use of these tools and/or to fashion them to meet better the major PHC management challenges.

MEETING THE CHALLENGE -- THE AGA KHAN NETWORK RESPONSE

Since 1981, the Aga Khan Foundation (AKF) has directed its health development programme on a course which aims to improve equity, accessibility and efficiency of health care, mainly in developing nations of Asia and Africa where the need is greatest. AKF's international strategy emphasizes four major health themes which have the capacity to increase greatly the equity, accessibility and efficiency of health care in developing nations. This fundamental four-point health development strategy aims to:

(1) explore more effective organizational structures and more efficient management methods for primary health care;

(2) develop and broadly apply improved health technologies appropriate to primary health care needs;

(3) promote the training of community-based and community-oriented health workers; and

(4) seek more effective methods of health education and communications, aimed mainly at the education of women for the benefit this can have on health at both family and community levels.

The Foundation has supported innovative PHC efforts in Bangladesh, India, Kenya, Pakistan and Portugal. AKF has been mandated by its Board to learn important generic lessons from these investments in an effort to contribute more generally to the work of other NGOs and government health services who, like the AK network, are striving to achieve more equitable and efficient health services. To this end, the AK network -- including non-AK institutional grantees of AKF, such as the National School of Public Health in Portugal -- is programming a "critical mass" of primary health care projects and will conduct a comparative analysis of results of these projects to seek generic lessons which can help other professionals who share the health-for-all objective. Establishing the basis for a comparative analysis of PHC projects involves the development and use of standard indicators for monitoring and evaluating primary health care programmes, applying clearly-stated common definitions of terms and using comparable classifications of data, as well as comparable data presentation formats. Substantial progress has been made in this process, but the quality and utility of the comparative analysis will depend to a great extent on the quality, utility and comparability of project-specific data sets.

The Aga Khan Foundation and its sister institutions -- the Aga Khan University (AKU) Faculty of Health Science in Karachi and the multinational Aga Khan Health Services (AKHS) -- have seriously accepted the challenges inherent in the PHC approach. As a means of broadly reorienting health professionals and other health workers, both within and outside the AK network, AKF, AKU, and the AKHS have conducted a series of workshops on various PHC themes and achieved a major reorientation towards PHC and the health-for-all strategy.

In 1981, AKF, WHO and CIDA, the Canadian International Development Administration, cosponsored a conference in Karachi, Pakistan, on *The Role of Hospitals in Primary Health Care*, hosted by AKU and the Government of Pakistan, which produced an important document and facilitated the difficult process of bringing hospitals and the medical "establishment" more in line with PHC/HFA goals, objectives and action plans. The Director-General of the World Health Organization -- who participated in the conference, along with His Highness the Aga Khan and President Zia of Pakistan -- says in the Foreword of the report:

> *"I am especially gratified to see the unequivocal support given by His Highness the Aga Khan to the outcome of this conference. With his support, a major ally for the 'health-for-all' movement has been gained. In shaping his health services and educational institutions along the lines described, he will no doubt provide an important example for others to follow."*

His Highness the Aga Khan responded in his Foreword to the report, by saying:

> *"Hospitals, as the first conclusion of the Karachi conference noted, have an important role in fostering the growth of primary health care... The challenge faces all of us working in the public and private sectors. We can back away from it... Or, alternatively, we can move ahead to initiate practical programmes based on the spirit and conclusions of the conference and upon our common needs and aspirations. Implementation of this may be difficult, but... I for my part will do what I can to encourage our Health Services and the Aga Khan Foundation to work towards the realization of the conference conclusions, and with the support of the World Health Organization progress must be possible."*

In 1983, AKF and AKHS cosponsored a workshop on *Management and Evaluation of Health Programmes* and, in 1984, AKF and AKHS cosponsored another workshop on *Planning and Managing Primary Health Care Programmes* which resulted in the Aga Khan Health Services' "Nairobi Declaration on Primary Health Care" which set into motion an AKHS-wide reorientation to PHC and the health-for-all movement. Today, AKF, AKU, and AKHS are collaborating closely to implement better managed and more efficient PHC programmes.

In 1985, AKF, UNICEF and WHO jointly planned and conducted an international workshop in Sri Lanka on *Primary Health Care Technologies at the Family and Community Levels*. The informative workshop report promotes PHC technologies in four areas which are appropriate for family and community-level applications: 1) delivery care, 2) nutrition, 3) immunizations, and 4) health education and communications. The demand for this

publication -- of which 10,000 copies were printed -- has been extraordinary, indicating a genuine and crucial need for this information as one means of more vigorously decentralizing health programmes and targeting health interventions at the family and community level. Current literature and experience from the field indicates that the same is true of PHC programme management, most particularly PHC management information systems, alternative data management techniques and use of microcomputers.

EMBRACING THE CHALLENGE CREATIVELY BY IMPROVING PHC MANAGEMENT TOOLS: MANAGEMENT INFORMATION SYSTEMS AND MICROCOMPUTERS IN PHC

Many, if not most, PHC projects have experienced difficulty in conceptualizing, planning, establishing and using management information systems effectively. Improved management tools and methods are needed.

Management information systems need to be simplified and streamlined to meet local health management needs. PHC programme managers need better information, geared to the programme's objectives and targets, and information officers and other data managers need more efficient methods to collect, process, analyse and present data meaningfully and with clear understanding of the intended use of that data from the manager's perspective.

The World Health Organization, AKF, AKU, AKHS and the National School of Public Health in Portugal are but a few leading organizations which are embracing this challenge and creatively attempting to make more intelligent use of available tools and to fashion new tools and methods where necessary. WHO's new focus on district health system management (which -- it is important to note -- conceptually includes community level management) conceptually is very important to the process of improving PHC management information systems, which is the major PHC management tool. What special tools can be applied to improve management information system (MIS) performance?

Microcomputers are becoming increasingly recognized as one of the most useful management tools available today. However, PHC planners and managers can usefully apply this powerful new tool only when basic issues and practical questions have been addressed and clearly answered. Such issues concern: programme objectives and targets; information requirements of programme managers to make informed management decisions; objectives and functions of the MIS; specific management methods to be used; training and education of health workers involved in the MIS and in programme management at each level of the health infrastructure; prevailing administrative and managerial structures under which the programme operates; and the respective roles of communities, CHWs and the health care organization(s) involved in the programme.

Khatidja Husein (second from left) discusses health records with community health workers while data is entered into the microcomputer at the Aga Khan Community Health Programme in urban Dhaka, Bangladesh. (Photo by Jean-Luc Ray, AKF)

Many PHC initiatives are now at a point where exchange of experience and technical information on management information systems and microcomputers is needed as a means of improving efficiency and giving a strong boost to their achievement of programme objectives. Such exchanges could, at the same time, have a potentiating and multiplying effect in making important contributions to the current state-of-the-art on managing PHC programmes. Several programmes are currently adapting microcom-

puter software to meet the specific needs of PHC programme managers, and others are anticipating installation of microcomputers without adequately assessing (or sometimes even recognizing) their management information needs. Given this, AKF, AKU and the National School of Public Health in Lisbon planned and conducted a workshop which drew together experts in a variety of fields to address these challenges and, collectively, make a contribution to the state-of-the-art.

The international workshop on Management Information Systems and Microcomputers in Primary Health Care was organized and sponsored by AKF, AKU, and the National School of Public Health in Portugal. It was conducted November 9-12th, 1987, at the Gulbenkian Foundation Conference Centre in Lisbon, and achieved, to a large measure, the following objectives:

(1) to help meet a major need of PHC programmes to develop more efficient management methods and more reliable management information;

(2) to build on experience gained by AKF grantees and facilitate achievement of their programme objectives by early exchanges of technical information;

(3) to transfer experience gained, lessons learned, and practical technical information from operational projects to new projects; and

(4) to document this practical technical information in a formal report which would be useful to PHC programme planners, managers and information officers.

The workshop methodology included:

- self-assessment by PHC programme managers (using guidelines developed by workshop organizers) of the strengths and weaknesses of their own MIS, its utility, and their use of the information generated in managing their project and guiding it towards achievement of stated objectives;
- review of these "case studies" and on-site interviews and discussions with PHC programme leaders by a team of two or more workshop organizers;
- consolidation and analysis of the results of the case studies;
- identification of major issues of management, management information systems, and microcomputer applications.

This, in addition to substantial reading of technical background documents on the subject, set the stage for the Lisbon workshop.

The workshop preparations and process were guided by a steering committee of twelve members from AKF, AKU, AKHS, the National School of Public Health in Lisbon, the University Research Corporation's Primary Health Care Operations Research Program (PRICOR), The World Bank, and four universities in the United States and Africa. Workshop technical discussions focused on five significant areas, all related to improving the effectiveness and efficiency of PHC programmes:

(1) **Community-Based PHC Management Information Systems:** Technical Working Group led by Jack Reynolds (PRICOR/URC), John Bryant (AKU Faculty of Health Science) and Bazmi Inam (AKU Faculty of Health Science);

(2) **Management Information Support for District Health Systems Based on Primary Health Care:** Technical Working Group led by Duane Smith (WHO), Holger Hansen (University of Connecticut School of Medicine), and Mehtab Karim (AKU Faculty of Health Science);

(3) **Cost Analysis in Primary Health Care Management Information Systems:** Technical Working Group led by Andrew Creese (WHO), Margaret Phillips (London School of Hygiene and Tropical Medicine), and Amina Rawji (AKHS, Kenya);

(4) **Microcomputers and Alternative Data Management Techniques:** Technical Working Group led by William Bertrand (Tulane University and University of Kinshasa Schools of Public Health), Barbara Echols (Duke University Medical Center), and Khatidja Husein (Aga Khan Community Health Programme, Dhaka, Bangladesh); and

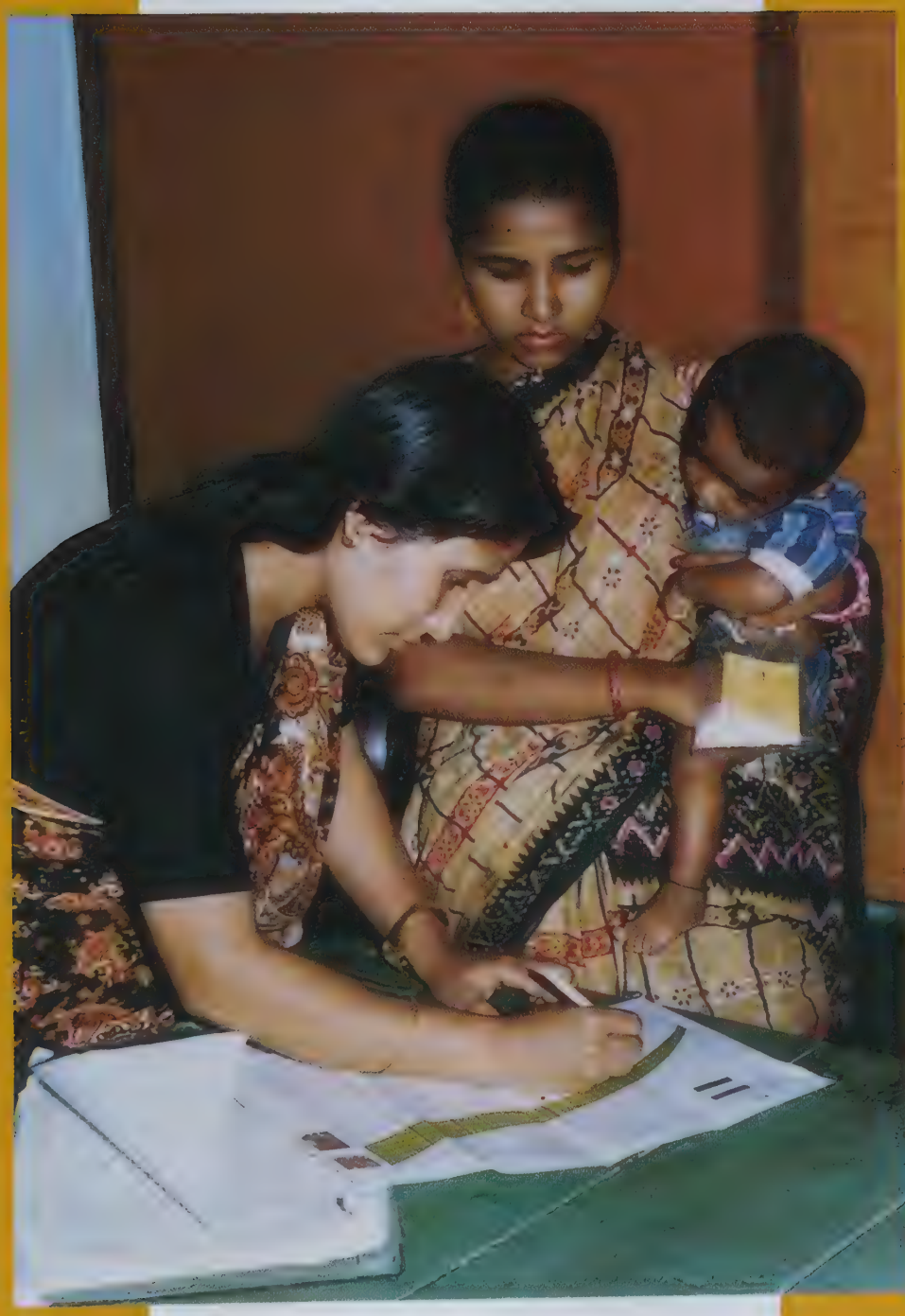
(5) **Microcomputers in Primary Health Care Planning and Management Decision Modeling:** Technical Working Group led by Alexandre Abrantes (National School of Public Health, Portugal), Trygve Myhre (Oak Ridge, Tennessee), and Adelaide Oliviera (National School of Public Health, Portugal).

Over fifty experienced participants from fourteen countries, mainly in Asia and Africa, worked diligently at the intensive four-day workshop and produced informative and substantive technical working group (TWG) reports on the five high priority themes. The TWG reports are presented in Chapters 9-13 of this report, and are notably "bold" in pursuing fresh approaches to and fashioning new tools for more efficient management of PHC programmes.

Chapters 1-8 present challenging keynote addresses, stimulating presentations, and other major contributions to the workshop. The conclusion section pursues further the next steps and the implications of taking fresh approaches and applying promising new microcomputer technology.

The reader is encouraged to innovate, fashion new tools, and use new managerial methods with the capacity to greatly enhance PHC programme management and efficiency.

CURRENT PERSPECTIVES



In Dhaka, Bangladesh, a community health worker teaches a mother how to use a "road-to-health" growth chart to assess the nutritional status of her child and, if the child is malnourished, how to improve feeding practices at home.
(Photo by AKCHP, AKU)

Management Information Systems and Microcomputers in Primary Health Care: Issues and Challenges

Robert Schware, The World Bank

Dr. Robert Schware is a consultant to The World Bank's Information, Technology & Facilities Department. The views expressed herein are solely those of the author and should not be attributed to The World Bank.

One of the fundamental problems faced by primary health care (PHC) programmes in most countries, particularly the poorest developing countries of Africa and Asia, is how to expand PHC programmes to cover larger populations with less per capita financial resources. The international workshop on Management Information Systems and Microcomputers in Primary Health Care will attack this problem by exploring new approaches to management, by strengthening management information systems, and by exploring the potential of microcomputers in management of primary health care programmes.

Before identifying and elaborating key challenges and issues of improving PHC programme efficiency, three fundamental requirements must first be recognized:

(1) improved management of PHC programmes;

(2) relevant, accurate and practical information for the managerial process; and last,

(3) efficient and reliable feedback of information in developing and implementing PHC management information systems.

All PHC programmes must pay attention to these three requirements if growth and development of more effective management information systems is to be ensured. There are no easy or instant remedies, nor any shortcuts to establishing effective and equitable primary health care programmes. Concerted, patient and imaginative local, regional and national action is required.

THE PRESENT SITUATION

Information has had a remarkable rags-to-riches career in the public vocabulary over the past 40 years. It has surely been among the least likely candidates for international workshops funded by donor agencies like the Aga Khan Foundation, the various agencies of the United Nations, the Canadian International Development Agency, the U.S. Agency for International Development -- to name a few -- but so it has become. It has come to be connected with a historic transition in our economic life, affecting all sectors of development, including health.

Despite recognized problems involved in using information to improve management, administration, training, and monitoring of primary health care programmes, it is clear that all PHC programmes can benefit from improved information systems. Information systems currently in place are often fragmented and produce redundant information and internally inconsistent data. Even when management data are routinely generated, they are seldom used effectively in planning and in giving direction to community health activities. At a time when widespread budget stringency is affecting efforts to improve the health of populations in developing countries, there is little evidence that financial information is widely used for planning the best use of available resources and for retrospective cost analyses.

Some health programmes have introduced microcomputers and other programmes are beginning to do so. Because of the microcomputer's small size relative to their computing capability, their low cost, and their ready availability and ease of use, microcomputers are being used in more and more primary health care programmes. Improvements in memory technology (increases in storage density and speed of operation, and decreases in energy consumption) and portability have further encouraged this trend.

To date, microcomputers are used more as data entry machines than as vital management tools.

Microcomputers are vastly underutilized as a tool for the development of reliable management information systems, and for providing deeper and better analyses for more cost effective and efficient management.

MANAGEMENT INFORMATION SYSTEMS (MIS) AND MICROCOMPUTERS: ISSUES AND CHALLENGES

A wide array of issues must be addressed, if the development and use of management information systems and microcomputers are to improve management of PHC programmes and increase both the equity and cost-effectiveness of PHC. The following issues will have to be realistically addressed:

- specifying the **purpose and objectives of MIS** at community and district levels;
- distinguishing the **types of information required** from what may be merely desired at both macro, or organizational, and micro, or community levels;
- understanding **organizational issues** that will have to be resolved as a result of introducing an MIS, including managerial and administrative changes needed to support the effective operation of the system;
- defining in practical terms the most useful **indicators of programme effectiveness and efficiency** (for different user groups ranging from community members to district primary health care teams, to ministry of health officials to donor organizations) and the procedures for generating and reporting regularly on such indicators;
- specifying and monitoring **data collection, compilation, and analysis** requirements and procedures;
- describing reporting requirements and **procedures for generating and using processed MIS data and management information** and doing this in terms that health care staff can understand and interpret;
- clarifying the PHC programme's **capacity to absorb technological innovations**; and
- determining **personnel requirements** for operating and utilizing a MIS and microcomputer equipment, including education, experience, training, supervision, and incentives.

In addition to these issues, three challenges to PHC management must be faced, and they deserve high priority in primary health care programme planning and management, as illustrated in the following sections.

The first challenge concerns the importance of recognizing a need for improved data systems.

In 1984, the author worked in North Africa and the Middle East analysing projects involving microcomputers. One of these projects was the *Egyptian government's National Health Information System*. In 1981, the Ministry of Health proposed the system as part of a reorientation of its approach to health problems by examining current health needs and establishing priorities for meeting these needs. To achieve its goal, creation of a new management information system was deemed essential. The system's objectives were to gather data at the local level on how current health programmes -- such as immunization, fertility regulation, control of urinary schistosomiasis among school children, tuberculosis and rheumatic fever control -- were proceeding. There were other areas of interest as well, like the relative effectiveness of technical equipment, training needs, the cost (and cost-effectiveness) of various parts of each programme, and an overall assessment of the efficiency of health interventions compared to the Ministry of Health's targets for each programme.

Data were to be gathered by trained personnel in 3,500 health facilities (district hospitals, rural centres, local health units, emergency care units, family planning centres) spread through 250 districts in Egypt. The amount of data thus collected would be too great to be worked with manually; therefore, it was decided to install a microcomputer in each district.

There was a detailed needs assessment done, which compared various microcomputers and software written specially for the Egyptian system, allowing entry of data and printouts in Arabic. The study also examined the data processing workload required to satisfy the Health Ministry's needs. The raw data would be gathered monthly at the local facility level by trained clerks who recorded answers to the same questions each month on simple forms.

Once it was decided, on the basis of the study, which hardware and software to use for the system, two microcomputers and programmes were acquired for testing under actual environmental and manpower conditions. In the course of the testing, however, it was found that the data to be processed were incomplete, and what data did exist were not accurately or fully recorded on the forms designed for the project.

Testing and implementation of the information system was suspended until more basic issues of manual data handling were resolved. This became a process first of thoroughly **overhauling the data collection system at the local facility level**. By working with the clerks responsible for data collection, the need for accurate and complete recording of data was demonstrated. Second, it involved **upgrading the statistical apparatus within the Ministry of Health** because the accuracy of its statistics was essential if the information system was to produce usable indicators of the efficacy of Eqyptian health programmes.

The process took two years, during which one microcomputer was unused and the other was used for routine word processing and clerical work in one of the Health Ministry's offices. But the two years were not wasted time. Dr. Aziz El Kholy, director of the medicine and health care sector of the National Information for Egyptian Development project, summarizes the positive effect to the two-year period before actual testing and use of the microcomputers could begin:

> "*The microcomputer, just by being there, became the motivation for people to change their thinking and information gathering behaviour.*"

The microcomputer forced them to become more organized and to solve problems for more effective and efficient data collection. He advised those involved in introducing microcomputers into management information systems to "fossilize one's ambitions" for the project, and be prepared to wait however long it takes to do the preliminary organizational and administrative work before concentrating on the technology.

Ensuring data quality and systematic flow of information from the field level upwards is nearly as complicated as a related challenge, which is **defining minimum information needs**. Some PHC programmes are overloaded with reports and have considerable overlap of recorded data. Studies consistently indicate that health staff spend a disproportionate amount of time on activities not directly related to service delivery, principally on record keeping, attendance at meetings, and report writing. A minimum information package can help to streamline information requirements and present only relevant information on key indicators of particular relevance and utility to management at each level of the health infrastructure. Much more work in developing such minimum essential data systems appropriate to PHC remains to be done. Some of a microcomputer's most useful characteristics -- processing large amounts of data speedily and presenting outputs in a variety of formats -- can easily contribute to information overload. The pleas -- and challenge -- at this stage in the development of management information systems for PHC programmes is to not kill fleas with elephant guns.

The success of any management information system is heavily dependent on feedback of the data collected, which ideally provides incentives for providing accurate, up-to-date data. This is the last and most important challenge of all.

> Unless staff at all levels of a PHC programme understand the importance of the data they are collecting for aggregation and analysis, the value and use of the information system will be negligible.

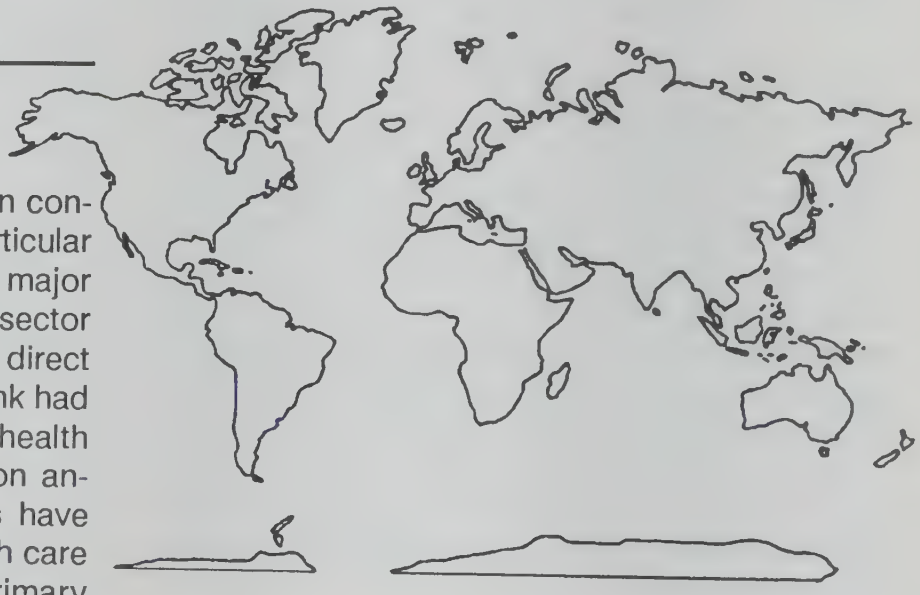
It is also extremely important to spend time and energy on the "feedback" process -- interpreting data summaries to those who provided and collected it -- particularly at the community level. Thus, involvement and meaningful feedback -- rather than hardware, software, or technical expertise -- are decisive ingredients in successful MIS development efforts. Innovative approaches are needed on the use of feedback as an educational tool to develop motivation and incentives to improve performance, to maintain good records, and to report regularly and on time.

The workshop's five Technical Working Groups (TWGs) address a wide array of issues and challenges associated with the design of sustainable and effective MIS. The TWGs' thematic foci are closely related and mutually reinforce one another.

THE WORLD BANK RESPONSE

The role of the World Bank as an institution concerned with long-term development is of particular significance in the health sector. Some major directions and Bank projects in the health sector are highlighted below. The Bank began direct lending for health in 1980. By 1983 the Bank had become one of the largest funders of health projects, lending more than US$100 million annually. Projects in over twenty countries have focused on the development of basic health care programmes, including expansion of primary health care, provision of drugs, and support for training and technical assistance. In its work with health, the Bank is placing particular emphasis, through its leadership and policy advice, on health financing. It is also concerned with a variety of other issues, including the appropriate allocation of investments in health based on cost-effectiveness criterion, the design of sustainable health programmes, and the need to improve management and training. The latter has included projects aimed at strengthening data management and information use at district level projects and in ministries of health.

Although a precise figure is lacking, a recent small survey identified over 260 projects the Bank has supported with information technology components in 63 countries in the last 20 years. Information technology is defined here as the combination of computer technology, micro-electronic applications, information, communication techniques and methods. This support ranges from a few microcomputers for data collection, processing, and analysis in a health and nutrition project to large mainframe computers for complex computing work in a petroleum exploration project. The cost of information technology as a percentage of total project costs varies considerably, from less than 1 percent to about 60 percent, or from US$200,000 to US$160 million. Size and cost notwithstanding, the most noticeable feature of Bank assistance is the growth in spending on information technology since 1981. During the last six years there has been an average annual growth of nearly 30 percent, a dramatic increase from the average 15 percent annual increases in the previous five years.



There is a gap between what is needed for development of effective management and information systems in PHC and what most donors are doing. Multinational donor agencies need to explore how to play a larger role in PHC management information assistance.

By working together, NGOs and government health services can most effectively introduce and use MIS and microcomputers in primary health care.

Information as a Primary Health Care Intervention: The Impact of New Technology on Improving Health for All

William E. Bertrand, Tulane University
and University of Kinshasa Schools of Public Health

The rationale for turning to the importance of management information systems (MIS) and the relatively high technology of microcomputers in primary health care is based upon two complimentary arguments. The first is the simple statement that relatively small amounts of human and fiscal resources are dedicated towards public health and improving quality-of-life issues. Furthermore, there is every indication that the per capita resources available for these activities are declining on an international level, particularly in developing countries. It is a truism to say that much more needs to be done to improve individual health status in order to reach the laudable goal of health for all by the year 2000.

Improving the efficiency of the management of available resources is one way of effectively adding to their relative impact. Strongly related and supportive of this idea is the following statement made in a 1987 World Health Organization Report:

> *"The main constraint reported by practically all countries is inadequate information support for the managerial process."*

Yet inadequate information does not always mean collecting more information. A series of recent studies by WHO in different countries around the world found that an average of 40% of the working time of primary health care (PHC) workers was spent in filling out forms and collecting data. This figure of 40% is consistent with some of the author's studies carried out over the last three years in Africa and Latin America. Thus, well designed and targeted primary health care management information systems (PHC/MIS) will hopefully reduce the time dedicated to information tasks and increase the human resources available for direct service delivery. A reduction of between 40 to 50% appears to be a feasible goal liberating up to 20% of the PHC workers time for more appropriate activities. Spread over all of the countries where PHC has been selected as the strategy for health care delivery, the increased human resources available by developing more efficient PHC information systems gives us a strong rationale for this workshop. Liberating this resource may be the single greatest improvement that can be made worldwide for PHC.

> The absolute measure of the utility and efficacy of a primary health care management information system is its impact upon the health status of the individuals and community where it is installed.

While the magnitude of the improved impact on health status of populations to be expected by providing adequate support for the managerial process is unclear, it is the essential question for us to consider at this workshop. Our hypothesis is simply that **the use of microcomputer technology, in the various operating settings of primary health care, can improve the health status of the populations served through the mechanism of better resource management at many levels**. While this seems to be a straightforward proposition, the implications of how we deal with judging the value of management information in the PHC setting are profound.

As technology rapidly changes, the published literature regarding its impact in the field often lags. We are fortunate to have as an empirical guide for the further understanding of this problem the case studies presented by the various subunits of the Aga Khan network. Added to this is the author's own experience from Niger, Colombia, Guatemala and Zaire. While differing in content, all of these examples provide information which is illustrative of the points that one would like to make regarding the application of primary health care management information systems and the new

element of microcomputer technology use in the field.

The design of more traditional mainframe computer systems in the late 1970s attributed most past failures of computer-based management information systems to two complementary causes:

> *"(a) a lack of knowledge of human needs and motivation on the part of technically oriented system analysts and designers and (b) a lack of technical confidence on the part of general and departmental managers which makes them reluctant to intervene in design decisions."* (Mumford, Land and Hawgood, 1978)

These observations were true with respect to large centralized mainframe systems with their emphasis on the control of information processing; this may still be true of the microcomputer and even manual applications of current systems in use around the world today. Information is power and the temptation is to control its use and access. We still have far too much dictation of what should be the right information to be collected, with the field level managers not becoming involved enough in design decisions. As proof of this, we need only to examine the problems WHO has had in defining a list of indicators to be highlighted in measuring the progress of health for all by the year 2000. Even infant mortality is of marginal utility from the perspective of its ability to be measured.

The fact, however, that the microcomputer is designed to be a device controlled by the individual worker opens the door for a more participative process in designing PHC/MIS, one which is entirely consistent with the community orientation of primary health care in general.

Thus, we can summarize some of these concerns as to the different nature of our task with three major guiding principles for the development of sound primary health care management information systems with or without the utilization of microcomputers.

(1) The community should benefit through improved health status.

(2) All information users and producers should be considered in the design of a new system.

(3) All information users and producers should have access to information generated by the system.

Microcomputer applications in the developing world are in many ways a mirror of mainframe computer applications in the health sector in the capital-intensive developed world. Starting with the routine tasks of word processing and accounting and moving through communications, inventory control, personnel and patient case management, we cover the majority of present day applications. Other applications include surveillance and research which, along with special studies intended as operations research, complete most current use of microcomputers in PHC. A more detailed consideration of microcomputer use in the PHC environment relevant to the experiences from the field is given below, including a review of application areas and criteria for design and planning factors as follows:

MICROCOMPUTER APPLICATIONS:

* Area Census
* PHC Data Base
* Word Processing
* Accounting Inventory
* Special Studies
* Surveillance/Risk Detection

DESIGN AND PLANNING FACTORS:

* Should Be Designed at Local Level
* With PHC Worker Input
* Evaluated as to Intrinsic Social and Other Cost Factors
* Evaluation Criteria of Data Elements Objective

Using the above criteria, one can consider how microcomputers can be appropriately utilized in primary health care activities. Field experience illustrates some issues regarding what has been learned, but the field is a new one and the lack of published analytical studies is evident. Thus, most of the literature is at the descriptive and case study level.

This lack of published literature emphasizes the importance of meetings such as this one as a forum for the exchange of information and ideas. While the case studies varied greatly in their level of application of microcomputers they had all utilized the equipment available to them in at least one of the application areas cited. The most universal example was in the area of assistance offered in the execution of censuses, special studies, surveys and related applications. These

relatively more complicated applications have opened up a whole new range of potential management tools based upon the presence of the microcomputer which had not been available to the primary health care worker or manager before. While it seems contradictory that the most complex set of applications were utilized in almost all of the cases there are a number of very sound reasons why it is the first area to be impacted in PHC outreach programmes.

The value of population censuses and special studies has been evident to outreach health workers and managers from the earliest times; however, their execution has been costly and until the microcomputer hardly worth the effort. As a result, such studies were done most often in experimental or pilot areas and even there the data was slow in being collected, tabulated and presented in an appropriate format for decision-making. The arrival of the mainframe computers revolutionized the social and health science applications which related to surveys and special studies for programmes in developed countries. They did not significantly impact outreach programmes, particularly in developing countries, who had no effective access to them.

Little data collected in the public health sectors of most developing countries was of much value since by the time it was collated and analysed (a task seldom completed in under a year) it was out of date and of little utility for management decision-making.

What did happen, however, is that the university trained survey and study specialists developed an appreciation for what the computer could do and as a result began to increase expectations of what could be done with the data. These highly educated individuals saw the value of more field oriented data processing and, as the microcomputer began to develop as a viable alternative to large main frame computing, they turned quickly to applying the new technology.

Many of the innovative applications of the microcomputer technology were first tried in the resource-poor environments of smaller institutions and the Third World where educated people were constantly faced with the potential of electronic data processing but unable to access same. Thus the combination of individuals who appreciated the potential of the results which could be provided with the computer and who were predisposed through their education to use the equipment, were available and could realize time and cost savings in their work. Since this was the type of consultant required to assist in sampling and analysis of census and special study data, it is only natural that it was the first and most obviously used component of the case studies thus far presented. It is the only use present in all case studies as a direct tool for management information.

Based upon over thirty microcomputer-based special study situations, it appears that:

> In the areas of census taking, operations research and surveillance, the microcomputer has already had a revolutionay impact in making these tools relevant to decision-making for primary health care activities.

Microcomputers make such activities feasible in resource-poor environments for the first time. However, there is a warning which is reflected in the case reports in a milder fashion: there is the risk of doing more than is needed simply because it is possible and this should be carefully guarded against. Effort and care should go into the design of instruments and studies with clear stipulation of why items are needed in the various surveys; "what decisions will be made with the data" should be the criterion used to qualify its inclusion.

Learning to adopt microcomputer technology from this first subgroup of users is useful as a guide to what is needed in order to quickly introduce new technology in the PHC setting. The characteristics of the user group provide us with some direction for further implementation. First, they were educated as to the utility and the advantages in the work place of good information rapidly analysed and well presented. Second, their level of education was in general a bit higher making transfer of information easier. As we look at the levels where the microcomputer is to be utilized it will be important to keep these considerations in mind.

The next most-mentioned areas of application in the case studies of microcomputer utilization are well known. These are the areas of word processing and accounting/budget preparation activities on the PHC administration side. In these areas, primary health care activities are but mimicking the major applications of millions of microcomputers in the developed world. They are so well accepted as major aids to productivity that it is not necessary to go into great depth here to explain why they are so well utilized. What is clear is that their introduction is more difficult since the introduction of

the equipment is at the level of the less-highly trained secretary who is often resistant to new technology. With the proper training approach, however, this reluctance can be overcome and the improvements in productivity can be major.

Quite often, improvements in productivity can be introduced if, at the upper and middle management level, executives can be put on the microcomputers in order for other workers to model upon their behaviour.

At the end of a day of fieldwork, a community health supervisor enters data into the microcomputer, using a "friendly" software programme upon which the MIS of the AKCHP in Dhaka, Bangladesh is based. (Photo by AKCHP)

The problem here is often a cultural one: in some areas it is not appropriate for a manager to type or do otherwise mundane tasks. After training over 800 individuals from ministers to drivers in PHC settings around the world, the author is convinced that **the basics can be learned by anyone and, if the equipment is appropriate to their job and the equipment is available, they will use it**.

A final area of emphasis which comes from the case studies is an implicit critique of microcomputer applications in primary health care. In only one case has there been actual implementation of a community-based PHC information system and/or the keeping of case records on the microcomputers. While several causes are specified as to why this is so, I will suggest some structural as well as operational constraints which impede and, thus, may help to explain why this is one of the last areas to be implemented.

For those who have kept up with the literature regarding the measurable impact of primary health care outreach programmes on the populations served, it will come as no surprise that well-documented cases of such impacts are very rare. There are many reasons for this, but most relate to the multiple possible determinants of health status and the extended time periods needed to change elements of behaviour that relate to health outcomes. The only marked exception to this rule is immunization programmes where outcomes can be readily measured and the results quite visible in the short term. Thus, any selection of indicators of primary health care progress is, at best, a series of educated guesses from experts in the field suggesting what we should see happen in a well run programme and, at worst, a simple listing of all the possible things that might be impacted.

The case study examples have all mentioned the problems inherent in this area and have applied various degrees of rigour in their solution. Phrases like "were not judged suitable" or "did not function well" were utilized and in one case a much more detailed presentation of why certain indicators did not work was presented. Given the lack of clear and objective criteria for judging the utility of an indicator in the PHC application, this confusion is quite understandable. In fact, the AKF can make an extraordinary contribution, for which a sound base has been laid, by taking this "user response" to the development of a user-oriented information base and creating a true methodology for the development of a PHC information system that is adapted to the needs of the individual project. This adaptive process signals another barrier to database system development (also mentioned in the case studies) -- one that has its roots in sound adaptation theory.

The base of any PHC information system is the PHC outreach worker who is collecting and recording the data. If this worker does not receive some immediate feedback regarding the utility of this collected information, then motivation will be low and, predictably, the quality of the information will suffer.

At the same time the CHW is the least-educated member of the PHC team and the least likely to understand the potential value of information collected. Thus, when faced with demands to collect information for which not even the experts are sure of the rationale, we create a system which risks falling apart well before the stage of being introduced or formatted for a microcomputer. The case studies have quite accurately reflected this systemic problem.

While the answer to this problem is far from simple, there is an important role for the AK network in working towards its resolution. We have already pointed out the proven utility of the microcomputer to aid in special studies. The easy transportability of electronically-based information, either by telecommunications or the physical transport of diskettes, makes the medium ideal for comparative studies and rapid communications.

> What needs to be developed is a clear and concise protocol for selecting, testing the accuracy and utility of, and evaluating the use of indicators appropriate to the specific needs of different primary health care systems.

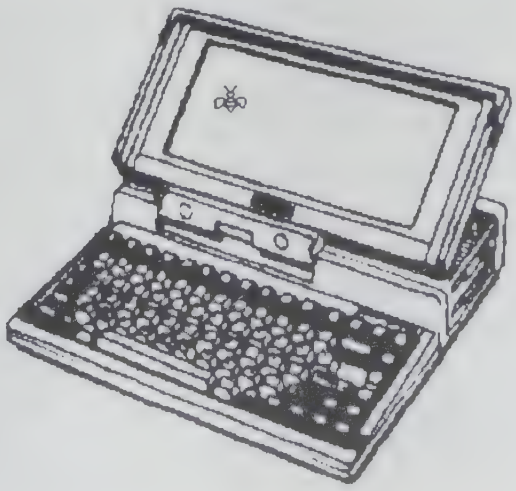
The AK network of primary health care projects provides the appropriate framework within which such a system can be developed: a level of centralized coordination which does not suffer from the political pains and pressures of many international donor organizations; a mechanism for developing training packages related to the field development of such a PHC information system development protocol; and what appears to be a predisposition towards the use of the appropriate technology, the microcomputer. What should result from this exercise is not a cookbook of standardized indicators, but a methodology which can be applied to any circumstance from which a user-oriented set of items can be developed which are appropriate to each situation.

Software and hardware combinations should be selected with an eye towards the ease of their adaptability, while keeping core elements untouched. I would warn against the too-early adoption of such a system based upon what the microcomputer can do and not upon a sound knowledge of what one needs to know. Many special studies need to verify the utility of subsets of indicators before we can adequately suggest and support a single system. But we can certainly develop a minimum set of expectations that any PHC management information system should fulfill.

As a final thought regarding the physical elements of microcomputer hardware which were mentioned in the reports and which our experience confirms, a major concern with many managers who have not yet had the experience of working with microcomputers in the field is "can they be supported?" With over 150 machines now working under the author's general supervision in several places in the developing world, it can safely be said that: **the microcomputer is an appropriate technology whose benefits far outweigh its costs in information intensive activities**.

We have learned that the machines can and should be maintained by local individuals and do not necessarily require IBM to be always around the corner. The clones and other compatible machines are much less expensive and have available replacement parts which can be easily substituted by someone at the level of a good television-repair person. I would also warn you all against the desire to have the newest and fastest technology. The older equipment is more than adequate for the majority of applications we have discussed and has the advantage of very low prices. The needs of the PHC environment should be what drives equipment and software acquisition, not the availability of some new item.

Much needs to be done in order to be more precise in the quantification of the benefits of this technology for primary health care. The AK network should build upon its initiative and unique set of circumstances to continue its leadership role. The result will hopefully be a well-documented protocol of the methods for introducing this technology around the world, with the resultant increase in resources available to improve the health status of millions of people. This is a unique opportunity and challenge.



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Management Information Systems For Primary Health Care: Hopes And Cautionary Notes

John H. Bryant, The Aga Khan University Faculty of Health Science

The workshop on Management Information Systems (MIS) and Microcomputers in Primary Health Care (PHC) has called forward an unusual amount of interest and even excitement among the planners and participants. Why is that?

To begin with, the subjects themselves are intrinsically interesting. PHC has the potential for bringing health services to the poor and the needy of the world. Management information, and particularly microcomputers, carry us out to the front edge of advancing technologies. And the workshop assembled an extraordinary collection of people, some with strong technical expertise, others with extensive field level experience.

Perhaps the excitement comes from the fact that the two groups of people are brought together, each with his/her own experience, to interact across disciplinary boundaries that usually separate them. Those who are close to information and computer technology look across that gap and realize they might be able to contribute to improvements in the lives and suffering of large numbers of people. Those who are close to the hard ground of PHC systems serving deprived populations see new and interesting possibilities for addressing their problems.

But there is another importance: this effort is integral to achieving the goal of Health For All (HFA) by the year 2000. This global purpose, established unanimously by the nations of the world at Alma Ata in the Soviet Union in 1978, set the moral guidelines, stated the political urgency, and recognized the technology that would be required if the world were to overcome the worst aspects of poverty and deprivation.

Here at the midpoint between Alma Ata and the turn of the century is a time to reflect on progress, problems and prospects.

PROGRESS, PROBLEMS AND PROSPECTS

First, the **progress**. HFA has not been a wistful but fading dream. It has characterized a new moral order, based on the pursuit of equity.

> That an ethical precept would be set forward and supported with an operational strategy as the central purpose and intent of an international organization, as has been done by the World Health Organization, is unique in the United Nations system.

HFA has become a fixture in national health policies, plans and programmes -- not always strong, not always effective, but nonetheless present -- to be seen as essential in the world's continuing quest for justice and peace. For concrete evidence: the rate of mortality among children under five has fallen to 50% of what it was 30 years ago; immunization rates have increased from 5% to 40% in 15 years; and it is highly likely that by 1990 half of all the world's parents will be able to treat their children's diarrhoea with oral rehydration solutions.

Second, the **problems**. There have been limited gains against the burdens of serious disease in the poorest countries. In many countries a fifth of all children fail to survive their fifth birthday. Severe economic recession has devastated the health services of Africa. In India and Pakistan, there are more deaths of children under five than in all 46 African countries. More than one billion people still live in absolute poverty.

The reasons for such extensive shortfalls are many: inadequate political commitment, failure to translate policy into programmes, shortages of resources, inadequately trained manpower, incompletely formed PHC systems, weakness in leadership at all levels.

Even where political commitment is present, even where the required technology is known, there are serious deficiencies at the district and community levels of PHC systems, particularly in management capabilities.

Third, the **prospects**. Looking ahead toward the turn of the century, of course there is much to do in all countries. No country solves all of its problems, and every country continuously encounters new problems. But, beyond argument, priority is with the poorest countries, and there the case can be made that one of the central problems, and one of the targets of opportunity, is with management and information systems at district and community levels.

The logic that managerial methods can bring to the organization and implementation of health services is well known, and deservedly so. **The analytical power and data handling capacities of microcomputers have immense potential for PHC systems in poorer countries.** This workshop was designed to explore those characteristics and search for new parameters of usage. The participants came from an extraordinary variety of relevant backgrounds, some highly competent in the technical aspects of management and computer applications, others highly experienced in field level practical pursuit of PHC in the poorest communities of Africa and Asia. Here is the potential for creative interaction.

HOPES AND CONCERNS

The central concept and governing ethic of the World Health Organization's (WHO) goal of health for all is **equity** -- that all be served, each according to need. Every person in a given population is to be taken into account; no one is to be lost from sight.

But equity does not mean equal, some have greater needs than others, and **the care received is to be according to need**. The challenge to system design and management is immense.

A parallel concept with its own ethical content, is that communities will be full partners in the processes of planning, implementation, management, financing and evaluation of health care. Such a partnership brings very important social resources to the health care effort, but it also requires that the partnership adapt to the concerns, hopes and capacities of people who often stand very low on the path toward development.

There are great possibilities of responding to those challenges. There are also deep pit falls:

- Systems can be designed so as to define and characterize all the members of a population and ensure that they are included in health care programmes, but will those systems be affordable?

- Management methods can be structured so as to match need with care, but will that require such sophistication of manpower that they will not be able to function at the levels where they are most needed?

- Information systems can be set up to keep track of virtually every health care interaction, but will not the data smother the people who must provide the care?

- Systems and symbols can be formed to denote key risks and points of danger to the health of the population, but will they be understood by semi-literate community health workers who have the social capacity to reach into community homes?

- Communities can be invited to participate in the planning and management of health services, but will the managerial methods be within their reach?

These are real concerns. They can be managed, given skill, sensitivity and close attention to the purposes of the management systems. The danger is an old one, that the systems will become ends in themselves, rather than means to bring more equitable and effective services for people.

An analogy can be instructive. A serious problem in the health sector world wide has been the medicalization of health care, wherein the complexity, sophistication and costs of diagnostic and therapeutic procedures have become so dominant as to push to the side the more personal and humanly sensitive side of medical care. In the developed countries this has been a matter of

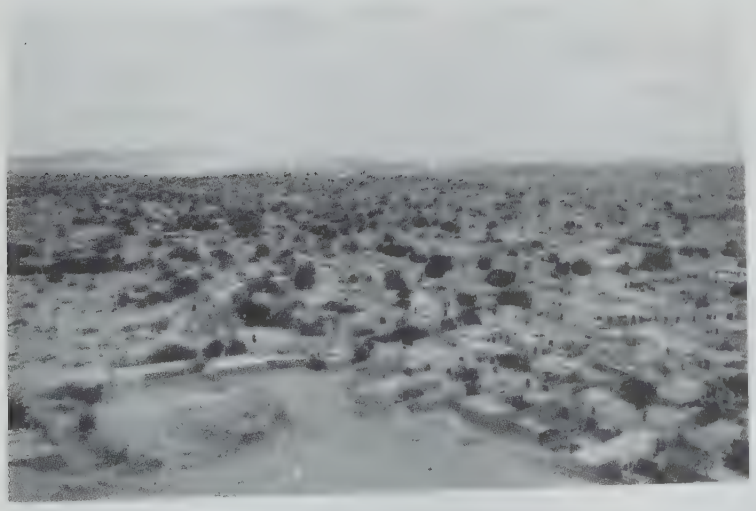
rising concern. In the Third World the problem borders on disaster. The transfer of technology has often been indiscriminate, the costs scandalous, and the technological distractions from priority needs ruinous. This is not to say that advancing technology must be excluded from the Third World, but sensitivity to needs and judgment about the use of resources are of prime importance.

Thus, for the Third World, the modernization of medicine has become one of the problems. Will the modernization of management and its new technologies become one of the problems, or will it be one of the solutions?

CONCLUSION

The following scene could take place in any country of the Third World, on any day; but it happened to take place in a squatter settlement of Karachi.

The *katchi abadis* (squatter settlements) of Karachi are one of the largest aggregations of urban poverty in the world. In more than 400 distinct communities, people live in and try to rise out of deprivation. The Aga Khan University (AKU) has established field sites in five such communities.



Orangi, a katchi abadi (squatter settlement) in Karachi, where AKU has launched a major PHC programme. (Photo by AKU/FHS)

PHC systems have been designed to meet the imperatives of health for all -- equity and community participation. Community health workers (CHWs), women from the community, trained in the community, visit homes with a careful regularity. They identify mothers and children who are at risk, such as children who are unimmunized or malnourished, for example, and see that they receive appropriate care.

A management information system tracks the activities of the CHWs: which houses they should visit, who is at risk, and what is being done. The MIS tells where they are succeeding and where they are falling short, and this information is fed back to them.

The *katchi abadi* programme has a problem, a simple problem, with profound implications. The programme has been quite successful in improving the proportion of children who are immunized; that is rapidly approaching one hundred percent.

But it is failing in trying to reduce the percentage of small children who are seriously malnourished. Malnourished children can be identified by weighing them and recording their weight against age on a standard chart (which tells us whether or not they are growing normally) and then followed to teach the mother to feed them more effectively. But getting poor and uneducated mothers to care for their children in different ways is extremely difficult.

Too many of them die. Malnourished children are very vulnerable to infections: diarrhoea or pneumonia can carry them away quickly. They are malnourished and vulnerable, and too often they cannot be saved.

The CHW is the key to reaching the mother, teaching her and convincing her to feed her child differently. How can the CHW, herself poor and often uneducated, recognize the importance of the problem and take effective action, including visiting that house as often as necessary, even daily?

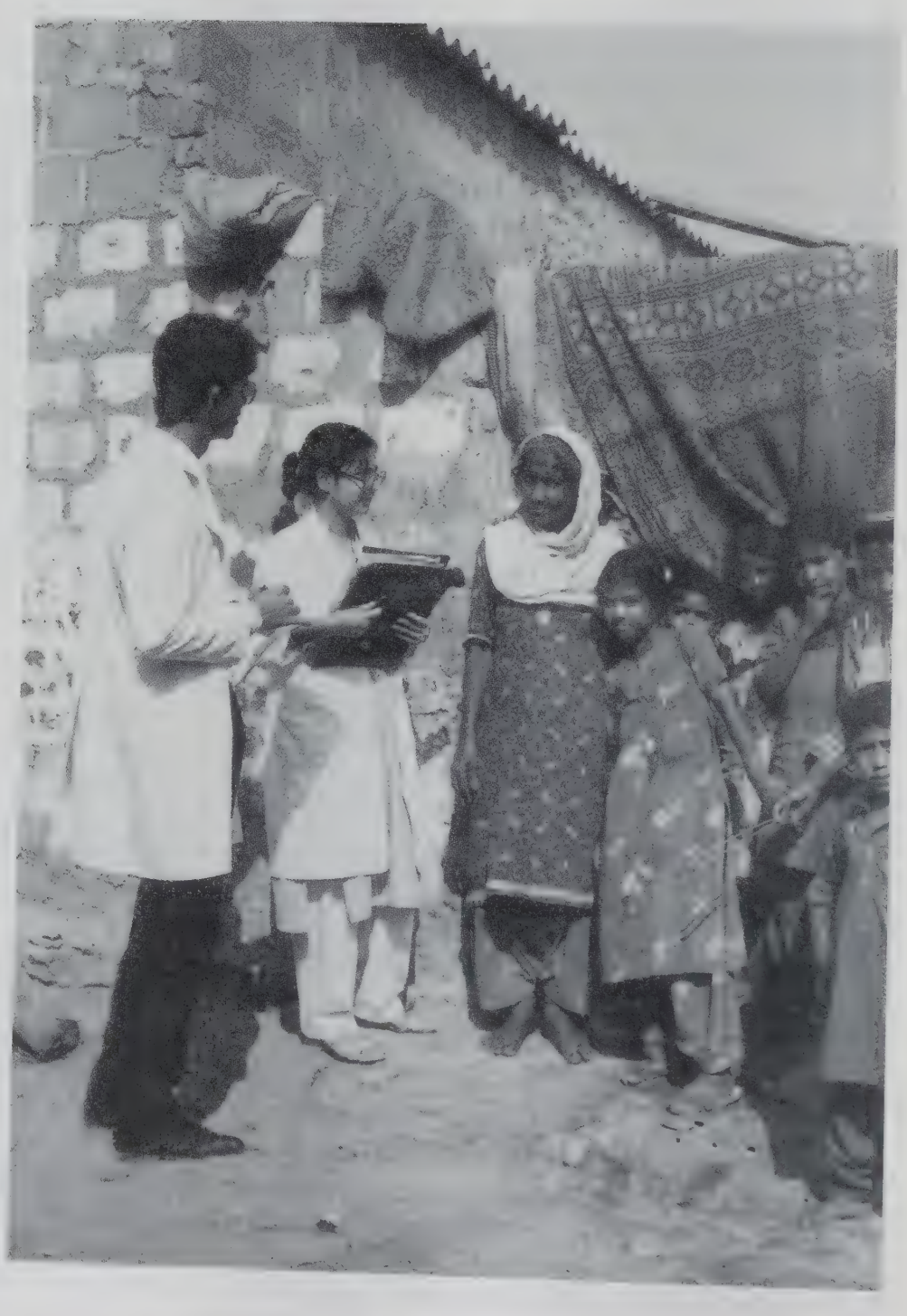
How can a management information system help? Computer printouts have nothing to offer here. An 80386 microprocessor will not reach an illiterate, Baluch-speaking CHW. Managerial matrices would be a cruel joke.

A field staff person designed a simple map to put on the wall of the health centre, one for each CHW, with her assigned houses marked out. Coloured pins were stuck into the map, denoting the malnourished children. Every seriously malnourished

child was indicated by a red pin. The CHWs visit the homes with the red pins frequently, sometimes daily. They have come to identify the homes with the red pins as their special responsibility.

We knew that our MIS was working when a Baluch CHW, an illiterate but dependable woman who wears a burkha that hides all but her eyes, marched into the health centre one day, snatched a red pin out of the map, threw it on the floor, stamped on it and raised her head, eyes flashing. This was a small victory that she and a mother had won for one tiny child.

This workshop has helped meet the challenge.



In the initial phase of the Urban Katchi Abadi PHC Programme in Karachi, organizers and medical students conduct dialogues with community members, survey households in the area, and help in the selection and training of CHWs who form the "backbone" of the programme. (Photo by AKU/FHS)

From Primary Health Care To Basic Minimum Needs and Quality of Life: The Challenge for MIS in Thailand

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CHARACTERIZING PRIMARY HEALTH CARE IN THAILAND

Along with other World Health Organization member countries, Thailand has vigorously pursued a primary health care (PHC) programme based on the Alma Ata declaration of 1978. However, Thailand has ten components or areas of concern, not only the eight elements covered by the Declaration. These are:

(1) **Health education**, which is focused on the methods for preventing and controlling prevailing health problems;

(2) Production of an adequate **food** supply and promotion of proper **nutrition**;

(3) Proper **maternal and child health** and **family planning**;

(4) Procurement of adequate supply of **safe drinking water** and observance of basic sanitation;

(5) **Immunization** against major infectious diseases;

(6) Appropriate **treatment of common diseases** and injuries;

(7) Provision of **essential drugs**, generally available in the community;

(8) **Prevention and control** of locally endemic diseases;

(9) Maintenance of **mental health** and the prevention and control of drug abuse; and

(10) Observance of **dental health**.

The national primary health care programme has been pursued by implementing a multipronged strategy which includes:

(1) Inter-/Intra-sectoral coordination;

(2) Community participation and leadership development;

(3) Health manpower development;

(4) Financial resource reallocation;

(5) Social resources mobilization;

(6) Use of appropriate technology;

(7) Research and development of PHC and basic minimum needs/quality of life (BMN/QOL) models;

(8) Planning and management improvement; and

(9) Identification and definition of basic minimum needs and the establishment of indicators to measure them.

IDENTIFYING PROBLEMS AND CONSTRAINTS

In Thailand, as in most developing countries, about 80 percent of the people live in the rural areas. These areas are often affected adversely by poverty, illiteracy, disease and civic inertia.

Poverty

The absence of opportunities is often the cause of poverty. Opportunities are few for those who are illiterate. Most illiterate people come from the ranks of the poor and the poor are generally found in the rural communities. Without broad-based interventions, this vicious cycle cannot be broken.

Illiteracy

Both personal growth and community development are hindered by illiteracy. The illiterate is largely dependent on others, especially in the search for information since information is largely written. The written word is the major source of knowledge which, in turn, enables man to improve his life and living conditions. Without knowledge, man does not have the power to elevate his station in life. Worse, he contributes to the destruction of the natural environment. Instead of being an asset, he is a liability. Illiteracy also refers to the inability to use available information. Health illiteracy relates to a lack of health data and inappropriate use of health data.

Disease

The victims of disease are generally people who do not know how or do not have the resources to prevent and cure their afflictions. Hence, to fight diseases with lasting results, illiteracy and poverty must be eliminated at the same time.

Civic Inertia

The greatest constraint to eliminating poverty, illiteracy and disease is the fatalistic attitude of rural people. They feel that it simply has been unfortunate fate to have been born poor. They do not have the means to acquire education and, because of ignorance, fall victims of disease. This fatalism is a kind of inertia, the tendency to remain what they are and where they are all their lives. There is no desire to change for the better. They feel destined to be poor, illiterate and disease-prone throughout their natural lives. This extends to their children and to their children's children. They have accepted this to be the natural law which, therefore, must be observed.

INTEGRATING RURAL DEVELOPMENT PROGRAMMES

With the joint efforts of Thailand's Ministry of Education, Ministry of Public Health, Ministry of Interior, and Ministry of Agriculture, problems were addressed through the institution of the nine-point strategies specified above. The ninth strategy -- the identification and definition of *basic minimum needs* of the people in order to live a decent life -- is especially significant in the Thailand experience. Indicators to measure the extent to which each of these basic minimum needs are satisfied or met were described by a joint group from these four ministries to measure achievement of long-term social goals. Villagers use check lists containing thirty-two indicators as a way to determine problems and their priorities as a basis for planning intervention activities as well as to monitor and evaluate their results.

A series of Five-Year Development Programmes has been pursued with every level of the government bureaucracy involved -- from the village level to the sub-district, district and provincial levels to the central level in Bangkok. Activities at each level are coordinated by a development committee. At the national level, the National Rural Development Committee is chaired by the Prime Minister. Decision-making at every level is to be based on the use of appropriate information.

One of the key concepts of rural development has always been the axiom that the rural people, the ultimate beneficiaries of rural development efforts, must be self-reliant. They should learn to solve their own problems, to provide their own means, and to manage their own resources and development. However, because of poverty, illiteracy, disease and civic inertia, they must be assisted. There is a need to teach them and guide them to achieve these ends. "Dole-outs", however, must never be resorted to. The use of dole-outs as a strategy of assistance, which was common in the past, only taught people to be dependent and passive.

The first step that community development workers in Thailand undertook was to have the rural people organized and taught, through experience, how group dynamics work. Members of every village were mobilized. Existing community structures and customs were respected but, whenever necessary, new ones were introduced through community participation and local initiative.

> Today, Thailand's rural development efforts are being pursued by the active involvement of villagers -- from the bottom upwards. The basis of this approach is an appropriate information system which provides both the community and government agencies with a sound, rational basis for decision-making, planning, management, and evaluation.

BUILDING A REGIONAL RESOURCE BASE: THE ASEAN TRAINING CENTRE FOR PHC DEVELOPMENT

In 1982, through the assistance of the Japanese Government, the ASEAN Training Centre for Primary Health Care Development was established at Mahidol University (Salaya) in Nakhon Pathom. This Centre has four associated regional centres in various parts of Thailand to respond to variations in local needs. The Centre conducts many, varied types of training, including courses to develop leaders in various aspects of primary health care and quality-of-life development.

In 1987, the focus of the Centre's continuing training activities has been on information systems for primary health care and quality of life development.

> Since information is imperative in effectively pursuing the objectives of primary health care and quality of life development, then the collection, processing, storage analysis and dissemination of appropriate data must be properly managed. An effective information system at every level of rural community development must be established and maintained.

To meet this basic need, training activities were planned and conducted. A one-month training course on Information Systems for Quality of Life Development for the ASEAN region was organized and conducted to share expertise in this area with fellow primary health care workers in the region.

The objectives for this particular training programme were:

- to identify the needs for and availability of information/materials concerning primary health care and quality of life;
- to describe procedures and processes for their acquisition and storage as well as for linkages between identified focal points;
- to describe possible means for the distribution of information feedback materials to decision-making focal points.

Accordingly, the areas of emphases for the course contents of the programme were as follows:

- definition of information requirements;
- identification of required information sources;
- means of acquisition of such information;
- methods for information processing, including the use of microcomputers and classification systems;
- means for dissemination of information to identified target groups; and
- strategies for linkage of information sources/systems at and between different levels.

Based on a scientifically-structured evaluation by the participants themselves, the training program on information systems achieved its stated objectives very satisfactorily.

WORKING TOWARDS BASIC MINIMUM NEEDS AND QUALITY OF LIFE

To achieve these rural development goals which aim to achieve a reasonably high quality of life for all by the year 2000, resources must be shared. Together, we can move mountains. Divided or indifferent towards each other's problems, we remain where we are, what we are, and subject to the vicissitudes of time and the avarice of the unscrupulous.

Those who are fortunate to have more should share what they have with those who have less. Of course, those who have less must commit themselves to the proposition that they must help themselves to rise from where they are today.

> Management and basic minimum needs indicators, as tools for rural community development, require basic facilities and equipment. Microcomputers and appropriate software have been shown to be necessary, if not imperative, if management information system data are to be timely, accurate, reliable and adequate as basis for planning and operating primary health care and other rural community-development-oriented programmes.

These facilities become all the more imperative when basic minimum needs indicators are adopted as the basis for determining strategies and evaluating the effectiveness of programmes and projects. Also, information networking can increase effectiveness, but technical assistance is often required.

> *"In every developing community there are civic-minded leaders who want to help their people. Give them a handle and they will seize it and march like an army with a banner."* (Dr. Y. C. James Yen, China)

The handle leaders must be given is the information required to lead intelligently and to act decisively. Information is power and this power must be given to the people if they are to lift themselves up from their poverty, ignorance and ill-health. Information can be the basis for a revitalization and rejuvenation of the under served and underpriviledged communities to fuel the engine of development. It can also be withheld to retain the knowledge and power among the very few. The question is whether to share information and empower the people, or to keep it and enslave them. The choice is a clear and easy one for those dedicated to the well-being of the people. The decision is essential because it is inescapable; there is no compromise possible.

A lack of appreciation of the utility of data, lack of definition in the systems and the poor quality of data collection are common problems that have been reported from Thailand and other ASEAN countries. This suggests that the information systems, their organization and their maintenance are oriented toward information generation rather than information usage; not meeting recognized or felt needs. Information collection and processing become unwelcome chores to those who provide it only for others.

> The issue becomes one of the ownership of information. This is related to what information is collected, by whom, for whom, and for what purpose. As development belongs to the people, it is their right and their responsibility to participate in the processes of development.

And yet, how many information systems are planned with this in mind? The principles of PHC can be applied directly to the development of appropriate information systems: encourage local participation in decision-making, planning, and management. Thus, appropriate, acceptable and practical management information systems must be designed and implemented with full community participation.

Those who are responsible for implementation often do not perceive the relevance of data to their own work and, therefore, they do not undertake data management tasks with sufficient interest or motivation. Information systems should be examined with the fresh and purposeful orientation that one applies to the development of health services and community-level activities. Appropriate research and development activities should be conducted to develop information systems according to needs and in accordance with local conditions and development objectives.

This may mean that multiple (or single multipurpose) information systems will be required. But rather than contributing more to the overwhelming amount of information already being collected (much of which serves no actual use), new information systems should clearly define the specific data required, how it is to be used, and who uses it. Efforts are needed to reduce the information required, while making it more relevant and directly applicable to the users' activities. This, however, cannot be done in isolation, but must be done in the context of activities being carried out. That means developing the system with and for the users so that it will be sure to serve them well.

There is a great deal to do in order to create information systems that are appropriate, functional, and relevant. The main issues to be addressed concern how practical and relevant information systems can be developed; what approaches are most appropriate in terms of the principles of PHC; and the objectives of local social development activities.

DEVELOPING A STRATEGY ON BASIC MINIMUM NEEDS AND QUALITY OF LIFE

The Fifth National Economic and Social Development Plan (1982-1986) focussed on new approaches for rural development, including:

(1) Classification of all areas in the country into "poverty-stricken" and "normal" areas. **Poverty areas receive priority** when resources for development are allocated.

(2) Development and application of **appropriate technology** in solving priority problems of the rural people.

(3) Fulfillment of **basic minimum needs**.

(4) Promoting rural development through **intersectoral cooperation** and **active involvement of people and communities in decision-making and implementation**.

(5) Promoting **self-reliance** of people in the rural areas.

The Social Development Project in Thailand was initiated in parallel to planning for the Fifth Five-year Plan on economic and social development with emphasis on rural development. For long-term social development, including health development, it was felt necessary that clear-cut goals needed to be formulated.

The Social Development Project has not only reflected a shift of emphasis from the traditional growth-oriented strategy, but has also contributed to altering the nature and methods of planning and delivery of public services in the country. It provides for intersectoral cooperation among various government sectors, agencies, interest groups, people and their communities. In formulating social development goals through the social development process, the unique characteristics of Thai society and people have been taken into account in setting "Thai standard" goals to be achieved. Emphasis is put on the **quality of life** as an important objective in developing national human resources, so that each individual in the society will be qualified in terms of knowledge, skills and responsibility and, thereby, can contribute well to the progress of society.

Components of Basic Minimum Needs

(1) Adequate Food Intake of Good Quality and Safety

(2) Good Housing Conditions

(3) Full Employment of Working Age People

(4) Essential Basic Services (i.e., Health and Education)

(5) Safety in Daily Life

(6) Maintenance of Good Culture and Habits

(7) Adequate Supply of Daily Income Generating Work

(8) Family Planning

(9) Community Participation and Obedience of the Law

IMPLEMENTING THE BASIC MINIMUM NEEDS AND QUALITY-OF-LIFE STRATEGY

The Basic Minimum Needs (BMN) are defined as having nine essential components which are required by each individual in society. The BMN were formulated by the National Social Development Project in Korat Province and a few other provinces.

Based on the nine components of BMN, fifty-three indicators were developed to monitor progress on implementation of the strategy.

Conditions for Applying the BMN Strategy

To apply BMN for social development, two major conditions have to be met:

(1) Acceptance of BMN and cooperation by all concerned policy makers, academicians, administrators and, most important, people and their communities; and

(2) The rational use of existing resources and organizations for development at all levels, most particularly the village level, as a means of stimulating people to participate actively in the development process.

Guidelines for Applying the BMN Strategy

The BMN strategy applies tools to identify problems, needs, potential solutions to the problems and priority activities to be undertaken by the people in each village supported by *tambon* (sub-district) level organizations.

The BMN strategy requires joint planning by ministries of health, education, agriculture and interior to promote intersectoral cooperation, and to promote cooperation between government workers and villagers.

BMN provides the fundamental framework for elaborating the Sixth Five-year Plan for Economic and Social Development.

MEASURING BMN IMPACT ON RURAL DEVELOPMENT IN POVERTY AREAS

BMN help to eradicate poverty of rural people living in poverty-stricken areas by:

(1) Defining clear targets and indicators for rural development, including basic levels of socio-economic status and conditions of living.

(2) Enabling each ministry of the social sector (education, health, agriculture and interior) to be well informed of the people's needs in each area of the country in order to more effectively mobilize and allocate resources to people's needs and priorities.

(3) Enabling ministries of health, education, agriculture and interior to coordinate their activities more effectively and efficiently in rural poverty-stricken areas.

Seventeen out of seventy-three provinces have accepted BMN indicators for monitoring social development in rural villages including: five provinces in the north-east, three provinces in the north, two provinces in the south, and seven provinces in the central area, including Bangkok.

Key Provinces Initiating Use of BMN Indicators:

(1) Nakornrachasima (Korat) ... 980 villages

(2) Ubonratchatanee ... 2 villages

(3) Srisaket ... 2 villages

(4) Nakornsawan ... 5 villages

(5) Kampangpet ... preparation for gathering data from the entire province within three years

(6) Surin ... preparation for gathering data from the entire province within three years

(7) Bangkok ... finalizing and pretesting questionnaires in slum areas and suburban villages

Korat Province was the main launching pad for the Social Development Project in Thailand. Since 1980, rural development activities have been stimulated by the Korat Development Programme (KDP). Government officers needed to be reoriented to learn how to work most effectively with people in rural communities, and how to launch intersectoral support activities on a **partnership** basis. On the other hand, rural people had to be reoriented as well because formerly the villagers passively received aid and social welfare support, with the government being seen as a passive "donor".

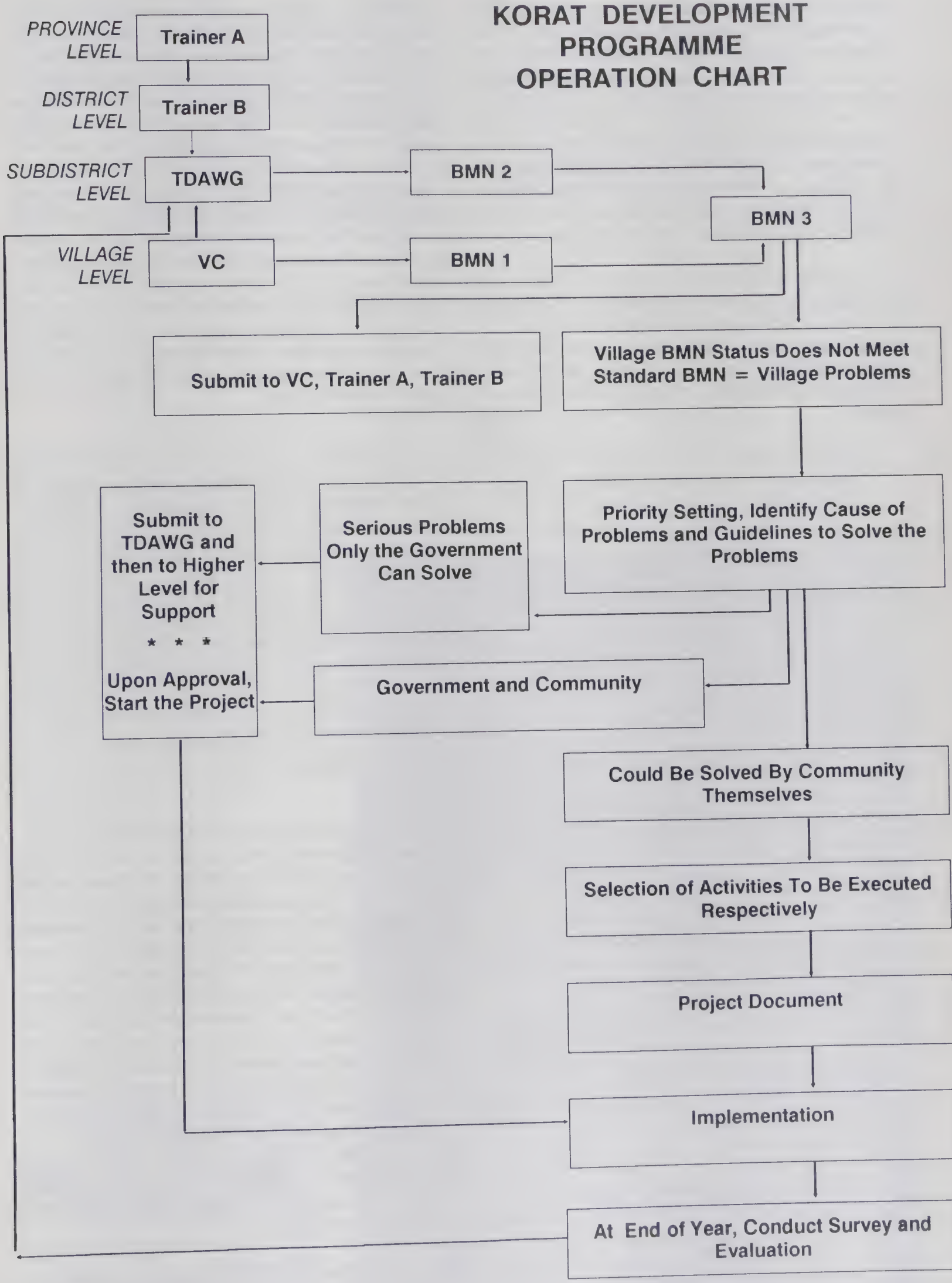
Numerous meetings, conferences, and seminars were required to effectively coordinate the different sectors and to learn to work together with the people at the grass roots level. Pilot villages in various districts were established as a part of a research and development effort to pursue better intersectoral support for rural development at the village level.

A coordinated system was initiated at the provincial level with those trained at a provincial level assuming training responsibilities for district and sub-district level training. At the sub-district level, members of Social Development Support Committees were trained. Finally, members of Social Development Support Committee are trained at the sub-district level, and made responsible for training members of the village committee.

> This training system covers all levels of administration so that concepts, principles and approaches involved in the process of community development through intersectoral collaboration can be effectively transferred to different levels of government employees in order to achieve a common intersectoral approach for promoting and supporting rural and village development activities.

The lowest level of government administration is the sub-district level. At this level, government officers form a group called the *Tambon* (sub-district) Development Activities Working Group (TDAWG). The TDAWG has seven members representing the ministries of Agriculture, Interior (Community Development), Education, and Public Health, and well-informed and capable villagers and the sub-district leader who acts as the chairman. The TDAWG is responsible for the training of the village committee.

KORAT DEVELOPMENT PROGRAMME OPERATION CHART


PROVINCE LEVEL
Trainer A
DISTRICT LEVEL
Trainer B
SUBDISTRICT LEVEL
TDAWG
VILLAGE LEVEL
VC
BMN 2
BMN 3
BMN 1
Submit to VC, Trainer A, Trainer B
Village BMN Status Does Not Meet Standard BMN = Village Problems
Priority Setting, Identify Cause of Problems and Guidelines to Solve the Problems
Serious Problems Only the Government Can Solve
Submit to TDAWG and then to Higher Level for Support
* * *
Upon Approval, Start the Project
Government and Community
Could Be Solved By Community Themselves
Selection of Activities To Be Executed Respectively
Project Document
Implementation
At End of Year, Conduct Survey and Evaluation

The main decision-making body at the village level is the Village Development Committee (VDC). All together there are twelve members in the VDC which is chaired by the village head leader. Village representatives are elected by the community.

When training village committees, emphasis is placed on how to identify priority problems faced by villagers, on how to be a good leader, how to mobilize villagers to help themselves, and how to solve priority problems at the village level.

The provincial working group of the Korat Development Programme devised a methodology for data collecting which could be understood by the villagers to learn about these basic minimum needs which they lacked. A problem identification form has been devised consisting of three different parts:

- **Part I ("BMN 1")** is used for collecting information concerning each household. Using one form per household, this form is used by the village committee responsible for collecting this information.

- **Part II ("BMN 2")** is used for collecting general village level data.

- **Part III ("BMN 3")** is used to aggregate data and summarize information collected through BMN 1 and BMN 2.

The actual process of using these forms is as follows:

(1) The Village Committee interviews households using BMN 1 and then submits these forms to the sub-district working group (Tambon level).

(2) The Tambon Development Activities Working Group collects relevant village information from the school, health centre, district office, and so on, using BMN 2.

(3) The Tambon Development Activities Working Group combines information from BMN 1 and BMN 2 in one form using BMN 3. BMN 3 thus describes village basic minimum needs status as well as sub-district (Tambon) basic minimum needs status.

Using the BMN 3 form, the Village Committee and Tambon Development Activities Working Group identify the priority problems, including those BMN standard items that have not yet been met by the village. The Village Committee then prepares a development plan to solve the highest priority problems. This proposal is then submitted by the village to the *Tambon* sub-district council. Based on a thorough review of the villagers' proposals, the Tambon Council makes a plan and proposal to be submitted to the district level for budget allocation and technical support. Thus, villagers impact the upward planning process.

The BMN survey is made every year. Once the village plan is agreed upon, the Village Committee is responsible for working closely with the villagers so they will be fully aware of what has to be done, who has to do it, and with what resources. Responsibilities for activities have to be clearly assigned. Villagers need to know whether particular activities will be carried out entirely by the villagers themselves, or with support from the government workers.

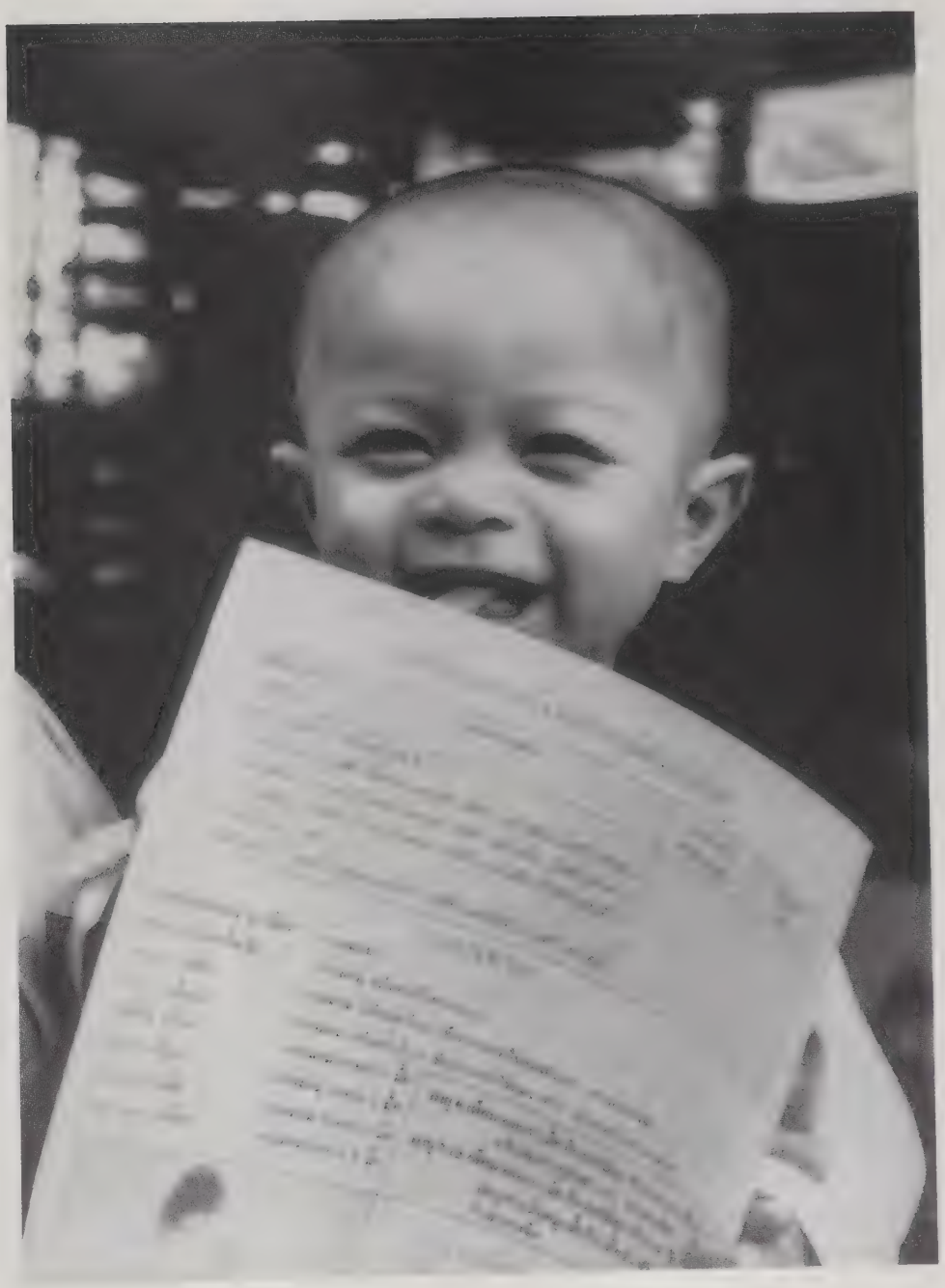
Through the BMN process, priority problems are identified and government employees learn to work more closely with the villagers in responding to their specific needs. Community involvement in the decision-making and implementation process is extremely important to solve their own problems. The basic minimum needs approach not only meets priority "needs", but also acts as a frame for intersectoral collaboration, more effective community participation, and self reliance.

The Social Development Project provides, at a district or village level, sufficient evidence that it is a viable approach which is having an impact at the village level. The project has created a strong spirit of cooperation at the village level, which is evident throughout Korat province. This spirit of cooperation exists between villages themselves and between villagers and representatives of various government sectors. Massive involvement of villagers in village development activities and programmes is evidenced by community projects to build communal facilities, improve general sanitation and environment, improve housing, provide adequate food supply and nutrition, secure purified drinking water, and build disposal systems, provide essential drugs and improve literacy through massive health promotional and education activities.

The project has developed training materials for training of trainers, for training of local officers utilizing basic minimum needs as entry point into

the economic and social planning, starting at village level and involving other levels of administration. The project has applied village modeling, conducted research and development activities to develop appropriate technology, studied financial resources and mechanisms, analysed adequate manpower recruitment and defined roles and functions of the community in social and health development activities, particularly primary health care. Mechanisms for various social sectors have been established, although such intersectoral mechanisms of coordination need further strengthening and institutionalization.

The "Campaign for Quality of Life of the Thai People" was initiated in 1985. Now, the experience in Korat Province is being utilized as an operational model for country wide application.



A smiling and happy child personifies the objectives of Thailand's 10-component national PHC programme and its 9-point strategy to meet Basic Minimum Needs (BMN) and ensure a high quality of life for all Thai people. (Photo by D. Taylor,

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Microcomputers in Developing Country Programmes: Valuable Tools or Troublesome Toys? Experience from Uganda and Nepal

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INTRODUCTION

The widespread interest in using microcomputers in the management of public sector initiatives is evolving some guiding principles that can be used in the introduction of computer technology into the management of health programmes in developing countries. There is a wide variety of influences on the structure and operation of an information system used by managers. If the system is computer-based, many of these influences relate to the choice of expensive hardware or software. Those who make decisions about system design may well have enormous difficulty in trying to predict the likely advantages and disadvantages of different configurations.

DEVELOPING REALISTIC GUIDING PRINCIPLES

When information systems are established it is desirable that a number of different activities are undertaken in sequence. These include the analysis of information needs, investigation of data sources, establishment of data processing pathways, specification of system, identification of appropriate software and selection of suitable hardware. However, in our experience, such sequencing is rarely possible in practice and our "guiding principles for computerization" need to be useful even in the imperfect conditions of the real world.

The status of **information** in health programmes in developing countries is extremely variable. In many countries information about the performance of programmes -- or even about their use of resources -- is not easily available to those who make decisions. They have become skilled at "instinctive management" and consider -- often correctly -- that the difficulties of obtaining potentially useful information are so enormous, they are happy to continue as they are. In other situations, managers have become heavily dependent on the timely availability of key information items, and utilize them fully in their decision-making. Clearly, there are many more situations that lie inbetween these extremes.

Similarly, the status of **management** in health programmes in developing countries is also evolving. Increasingly, management is seen as an essential activity, though the systems in which many health programme managers are expected to work are often so constrained by fiscal, cultural or political influences, that they have insufficient room for manoeuvre when attempting to execute their managerial functions. This applies not only to strategic management (planning new facilities or responses) but also to functional management (supervising the execution of existing responsibilities and services).

The ideal situation for evolving a management information system would be one where managers identified decision areas and specific information needs, but this is rarely achieved. Information systems are often devised by people whose professional training inclines them to do so (statisticians, epidemiologists) and they reflect the concerns of those who finance health programmes (Ministries of Health, foreign aid agencies or non-governmental organization head offices). It is not surprising that those who actually manage the allocation and use of resources may ignore -- or even try to undermine -- information systems ostensibly designed to help them.

Now a new force has arrived: the computer. Again, managers can easily view the computer (and its advocates) as a threat: it is modern western technology, still inaccessible to all except those who have professional training as computer users or to the privileged few who have managed

to work out how to use them. Alternatively, the computer can help managers to adopt information systems that suit their needs -- reducing their dependency on other professionals, or external agencies.

> Unless decision makers can understand, for themselves, the potential for computerization to facilitate their obtaining the information that they require, computers will increasingly be seen as oppressive and irrelevant devices by those who most stand to gain from their use.

Two case studies illustrate two important view points. The first is a description of the computerization of the Health Planning Unit in the Government of Uganda. The second is an account of the establishment of an information system in a district-level Maternal and Child Health/Family Planning programme in Nepal.

CASE STUDY 1: COMPUTERIZING THE GOVERNMENT OF UGANDA'S HEALTH PLANNING UNIT

Background

Throughout the 1970s and early 1980s, Ugandan society experienced successive political, economic and social reverses. Health services deteriorated dramatically and the concepts of primary health care (PHC) had little opportunity to find expression in the government sector. However, in 1983/4, relatively stable conditions prevailed in much of the country and it was possible for the Ministry of Health (MOH) to begin the process of rehabilitating its systems and services.

Two top priorities for the MOH were to conduct an inventory 1) of the health facilities in the country and 2) of the health workers employed by the MOH. The number, type or condition of health units was not known, nor did the Ministry have reliable information of those on its payroll. Indeed, there was almost no database to draw upon and the Health Planning Unit (HPU) had only one trained planner. To help the MOH overcome these constraints and acquire basic information to enable management functions to have some rational basis, the Canadian International Development Agency (CIDA) provided assistance, through the African Medical and Research Foundation (AMREF), to the HPU.

Computerization of the HPU -- Phase I

In mid-1984, a high level decision was taken by the MOH that a manpower inventory of government health staff be carried out by the end of the year; the HPU was given the responsibility for this task. Due to the urgency and the low level of establishment of the HPU, consultation took place between the HPU, AMREF and CIDA about the possibility of purchasing microcomputers (MC) for the HPU; these had not been originally planned or budgeted. In justifying the introduction of MCs, priority was given to establishing a computerized personnel management system (CPMS) for the MOH. Other anticipated uses were in the proposed revision and revitalization of a health service information system, word processing and project accounting.

While the decision to purchase computers was justified on technical grounds, the urgency with which this decision was implemented was also influenced by political considerations: a need for the HPU to demonstrate that it could effectively use the project money at its disposal. Thus, due to the pressure of time, the managers responsible for choosing computers placed more reliance on the advice given to them by potential suppliers than may have otherwise been the case.

It was considered important to obtain machines which were readily available in East Africa for which there was a good backup maintenance service. As microcomputers had not been originally budgeted for, it was important to obtain reasonably priced machines. Subsequent experiences proved that insufficient consideration was given to determining software requirements and the organizational impact of introducing a new technology, including the need for staff development. Olivetti M20 machines were selected and two were delivered to the HPU in October 1984.

These computers used a unique operating system, PCOS. Three application programmes were available: DBMS (database); Oliword (word processing), Multiplan (spreadsheet). The most suitable of these for processing the manpower inventory data was DBMS, but it had serious limitations:

- Reports could be produced in only one format (there was only flexibility in the choice of fields);
- Structural modification of records could not be done after a file had been created;

- DBMS could not count records in a given criteria (the only way around this was to list data and count records manually).

Five staff of the HPU -- the Director, two statisticians and two secretaries -- were given a five-day introductory course to computing and the software packages to be used by the company supplying the machines. A continuing programme of training was not instituted at the onset, but arrangements were made for a systems analyst in Nairobi to be available for consultation by telephone and to make the first of a series of site visits to the HPU within two months of the computers being delivered. The input of the systems analyst was to prove decisive in the ultimate success of the rather inauspicious beginning of computerization in the HPU.

Simultaneous with the introduction of computers, the manpower inventory was progressing but much more slowly than originally envisaged by the senior MOH officials, largely due to the again deteriorating security situation. From the perspective of the computerization exercise, this slow pace was an advantage, for it was not possible to begin the input of the manpower data until February, 1985. The time-lag occurred for two main reasons:

(1) Of those included in the basic training session, only one statistician had time to develop his computing skills.

(2) The secretaries had too many other commitments to input the inventory data. Hence, the statistician had to train two clerks as computer operators.

The statistician required assistance from the systems analyst in setting up DBMS to receive and process the inventory data, but due to unforeseen circumstances, her initial visit to the HPU was delayed by over a month to January, 1985.

Completed inventory questionnaires continued to be received, until by June of 1985 about 90% of government health manpower was covered. In September, 1985, the HPU was able to publish the first preliminary figures. These were well received and lead to requests for reports in other formats -- requests which the limitations of DBMS prevented the HPU from responding to satisfactorily.

When the M20s were chosen it was with the understanding that they could have MS-DOS installed easily and thereby enabled to run a wider variety of software. In order to overcome the limitations of PCOS, MS-DOS was now installed and a new word processing package, WordStar, obtained. While this was an improvement, problems remained and it was clear that a thorough review of the whole strategy for the computerization of the HPU was called for. The considerable flexibility of the organizations concerned enabled the following decisions to be made:

- M20s should be traded in exchange for IBM compatible machines (M24s were selected with the following software: WordStar, dBase III, Supercalc III, Microstat and MS-DOS as the operating system).

- A comprehensive training programme at three levels -- operators, programming and senior managers -- be formalized.

- A means be sought for formalizing improved conditions of service for the clerks who had been trained as operators.

Computerization in the HPU -- Phase II

In December of 1985, the M20s were replaced by M24s, one of which had a 20 megabyte hard-disk. The transfer of the manpower inventory to these machines required extensive programming since they were using a different operating system.

Training of operators and secretaries was more formalized as was continuing training to enable statisticians to acquire skills in programming. Workshops were held for the most senior users of the information, some of whom were now considering the introduction of MCs elsewhere in the MOH. The Ministries of Public Service and Finance created posts for computer operators and systems analysts.

It was not until March, 1986, eighteen months after the initiation of the national manpower inventory and the introduction of MCs, that the MOH had an appropriately equipped computer section with competent and confident staff able to produce information relevant to the senior decision makers.

Benefits of Computerization

Even in its development stage, and despite the computing difficulties encountered, printouts of the CPMS were useful to the Salaries Section and the Establishment Division of the MOH in their day to day work. By May, 1986 the existence of the CPMS provided the opportunity for work to begin on a health manpower plan for Uganda.

The computerization of the HPU also made possible the implementation of a revised district health information system.

At present, the system has only been introduced to a few districts and the dBase III applications developed continue to be refined. But initial results have been sufficiently encouraging for a number of donor agencies to finance the introduction of the system to districts where they have projects.

From the outset the computers were used in a variety of tasks in addition to the above. Word processing was the easiest capacity to exploit; it enabled the HPU to produce a Health Information Quarterly for all mid-level managers in the health sector, and it greatly facilitated the preparation of project proposals by the HPU for donor funding.

Issues That Had To Be Faced

The most immediate problems included:

(1) the need to upgrade the educational skills of computer operators; and

(2) the need to obtain services of a systems analyst during the lag period while programming skills were being developed within the HPU.

More complex difficulties included the establishment of appropriate training for senior managers and users of the information system. **A major requirement is to help managers evolve realistic expectations of what computers can -- and cannot -- do for them.**

Political pressure upon the HPU led to the introduction of computers before it was really ready to utilize them properly; this largely accounts for the initial problems. In this case, all of the parties involved were sufficiently concerned for the good of the HPU to support it through these early difficulties until it was able to take advantage of the new technology. But this is not always so, and it is important that those involved in the management of service units at ministry or district level are fully informed of the implications of introducing a new technology to their sphere of work and are trained in advance to use it appropriately.

CASE STUDY 2: A COMPUTERIZED MANAGEMENT INFORMATION SYSTEM IN SINDHUPALCHOK DISTRICT, NEPAL

Background

During the last 15 years the Government of Nepal has invested considerable resources in the training and deployment of paramedical health workers at community level, in constructing health posts and establishing district level health care management units. However, the establishment of an integrated system for health care delivery is a slow process. Different sections of the Ministry of Health are involved in pilot schemes which enable them to develop systems for managing district level health care appropriate to the extremely difficult conditions in Nepal.

A village health worker in Nepal records information on a man with fever after making a blood smear for detecting possible malaria during a routine visit to a household in his area. (Photo by D. L. Smith, World Health Organization)

The District Health Programme

In 1982, the Government's Mother and Child Health and Family Planning Project (MCH/FP) started to devise a new system for supporting the work of MCH/FP field staff that could be applied throughout the Kingdom. The system was to be

developed first in Sindhupalchok District by the staff working in the Children's Health Centre in Chautara, the District Headquarters.

Chautara District has a population of 220,000; it is subdivided into 79 *panchayats* (with an average population of 2,500 each). The MCH/FP had recruited field workers from these *panchayats* to motivate householders to adopt family planning measures and to promote improvements in their children's health. The field workers received a small honorarium.

At the time the project was initiated, the field workers' tasks seemed to consist almost entirely of male to male contacts to discuss family planning (using male methods). A new system of field work management was needed to:

(1) increase the numbers of households visited by field workers;

(2) improve the uptake of family planning and immunization in these households;

(3) increase the proportion of children who were registered at a mother and child health centre;

(4) permit an improvement in the reliability -- and utility -- of data collected by the field workers so that it could be used for management purposes;

(5) improve coordination between the MCH/FP field workers and the staff of other health projects active in the District (e.g., the vertical Expanded Programme of Immunization -- or EPI).

Implementing the system involved:

(1) re-examining field worker's job description;

(2) the frequency of field worker visits to households in the community;

(3) review of data being recorded by field workers;

(4) introducing a new in-service training programme for field workers;

(5) the reassessment of supervisors' roles and responsibilities; and

(6) regular reviews of project performance.

The Information System

A key element of the project was the establishment of an information system based on data collected by field workers every three months. Information from the data could be used:

(1) to enable **field workers** to:

- know the health status of households in their work area,
- to identify households which had yet to take up preventive services,
- to follow up individuals who were found to be ill;

(2) to enable **supervisors** to:

- assess the coverage of preventive services in the areas for which they were responsible,
- to identify *panchayats* where the field workers might be facing difficulties;

(3) to enable **local village leaders** to:

- have access to information about the health status of households in their work area;

(4) to enable the **district MCH/FP manager** to:

- assess the overall coverage of preventive services,
- to identify those areas where coverage appeared to be unexpectedly low or high,
- set targets for the proportion of the population in the *panchayats* to be covered with family planning or preventive services;

(5) to permit the **MCH/FP project chief** to:

- assess the extent to which the project was promoting improvements in the coverage of the district population with family planning and child health services,
- help him decide whether or not the approach should be implemented more widely.

The information required by each user had to be made available in a comprehensible form so that it could be understood by him/her and discussed with those for whom he/she was responsible. After discussions and some negotiation between the manager and field workers, it was agreed that six data items would be recorded by field workers at each home visit.

Database (dBase II) software was adapted to enable the computer to receive the data collected every three months by field workers. The software was also used to prepare programmes for data analysis and storage in a summary database from which customized reports could be produced.

Using this system, separate reports could easily be prepared for:

- **field workers** (list of households needing additional attention);
- **supervisors** (summary reports of field worker activities);
- the **district manager** (analysis of aggregate trends and results from individual panchayats); and
- the **MCH/FP project chief** (trends analysed with respect to the number of times each household was visited by a field worker).

Benefits of the Project as Revealed by the Information System

Uptake of Services: Are there changes from one quarter to the next?

The system enables field workers and their supervisors to receive regular summaries of the health of children in their areas within a week or two of handing in their data forms.

Table 1 shows sequential summaries obtained every three months from the village of Pipaldanda. The number of children seen increases as the number of families seen by the field worker grows. At the same time, some children reach five years of age and are no longer studied, while other families leave the area -- temporarily (for a day or two) or for much longer periods. The survey population therefore changes, and is subject to seasonal and other influences. Hence, sequential summaries did not always enable field workers to discern the effects of their home visiting on the health status of the children and adults that they were seeing. For example, Figure 1 shows that percentage of children, seen by the *Syaule* field worker, who had received over three immunizations fell in mid-1983; disheartening information at such an early stage in the programme.

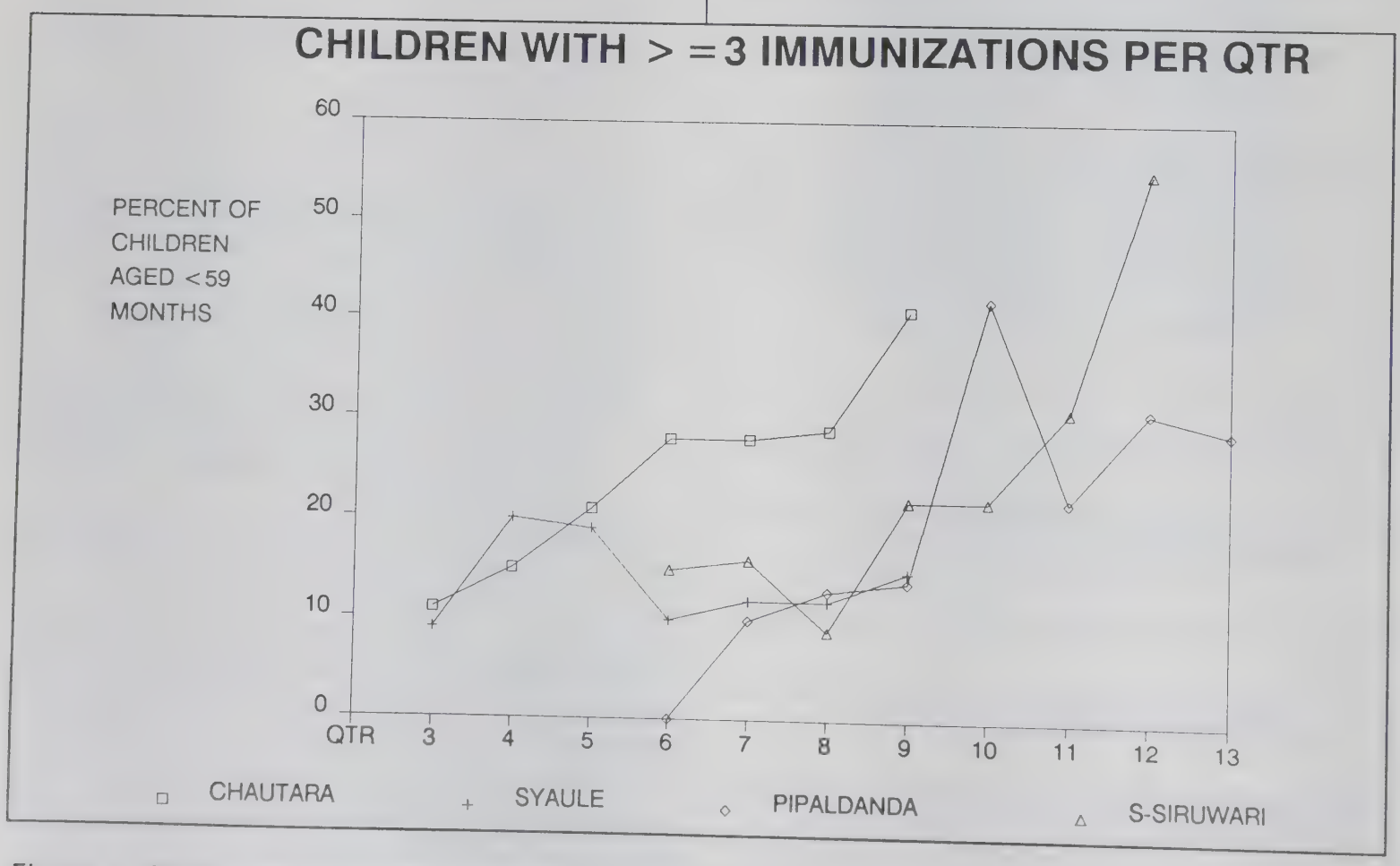


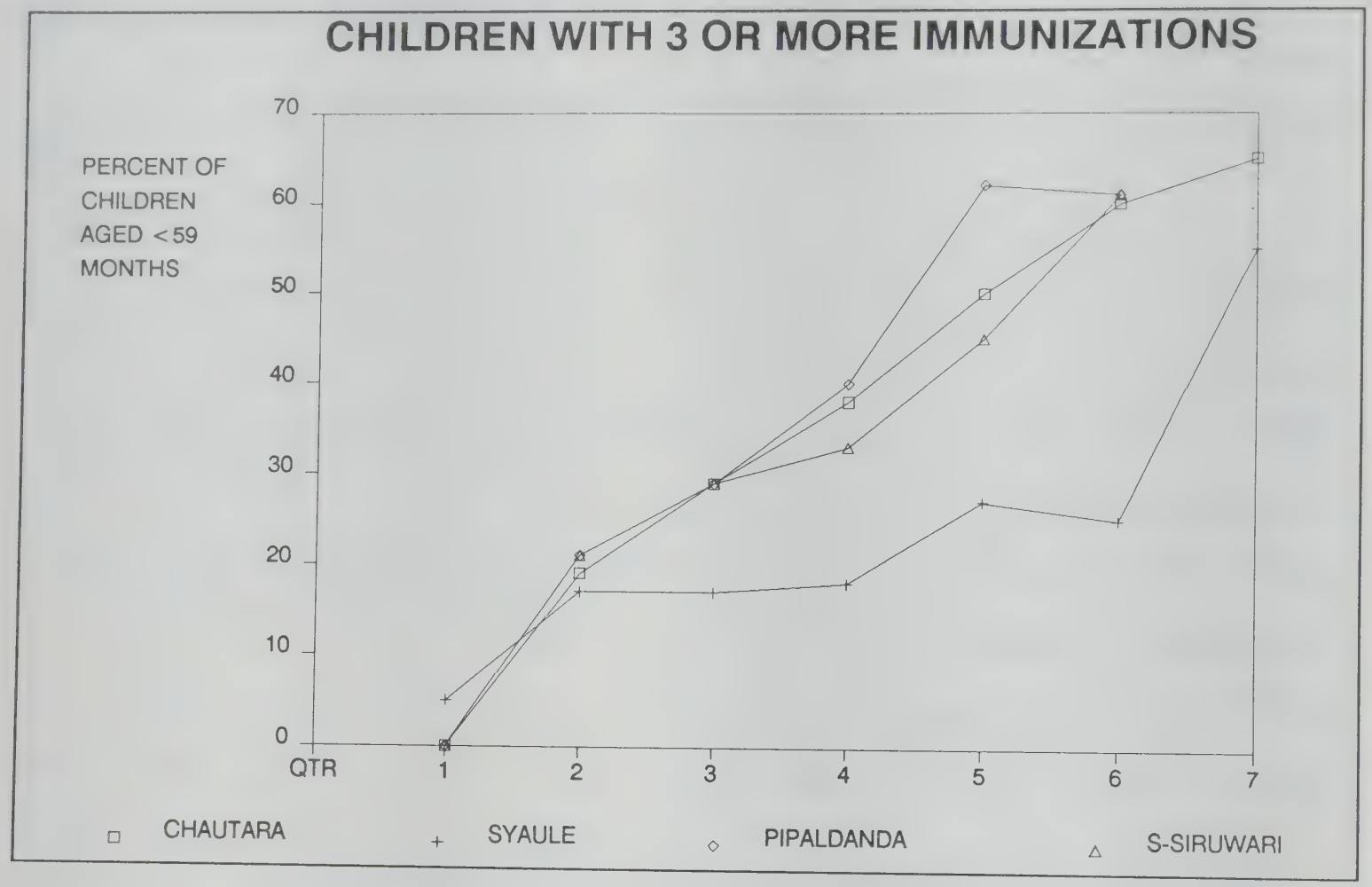
Figure 1. Children who had received at least three immunization injections expressed as a percentage of all children aged less than 59 months seen by panchayat field workers from Chautara, Syaule, Sano-Siruwari and Pipaldanda between the start of the study in quarter 3 (mid-October 1982 - mid-January 1983) and quarter 13 (1985).

Three Monthly Community Surveillance: Children Aged 0-5 Years

WARD	0	0	0	0	0	0	0
QUARTER	6	7	8	9	10	11	12
FILENAME	PDAN 0Q6	PDAN 0Q7	PDAN 0Q8	PDAN 0Q9	PDAN 0Q10	PDAN 0Q11	PDAN 0Q12
YEAR	2040	2040	2040	2041	2041	2041	2041
FIRST MONTH	SRAWAN	KARTIK	MAGH	BAISAK	SRAWAN	KARTIK	MAGH
LAST MONTH	ASOJ	POUSH	CHAIT	ASSADH	ASOJ	POUSH	CHAIT
Number of families in study	22	95	60	186	100	220	171
% using family planning	4.54	3.15	10.00	6.98	9	7.27	6.43
Number of births last quarter	1	10	5	10	5	9	9
Number of deaths last quarter	0	0	0	1	4	0	2
Number of children (0-5 yrs) seen	18	116	70	181	91	205	172
% registered at clinic	72.22	35.34	67.14	64.64	65.93	63.41	68.02
% well (with no symptoms)	77.77	81.03	62.85	72.92	82.41	88.29	80.23
IMMUNIZATION COVERAGE:							
Number of children aged 0-35 months	9	84	53	130	60	136	113
% children with no immunizations	55.55	65.47	49.05	44.61	36.66	46.32	34.51
% with at least three immunizations	0.00	11.90	16.98	28.46	45.00	25.73	33.62
NUTRITIONAL STATUS:							
Number of children aged 12-59 months	14	84	53	139	77	162	138
% with green armband (>13.5cm)	36.71	75.00	60.37	51.07	61.03	66.66	65.94
% with yellow armband (12.5cm - 13.5cm)	42.85	17.85	33.96	33.81	28.57	25.92	31.88
% with red armband (<12.5cm)	7.14	5.95	1.88	14.38	10.38	7.40	1.44

Table 1. Sequential Data Summaries Obtained Every 3 Months from Pipaldanda Panchayat for Quarters 6 to 12 (mid-1983 to 1985)

Figure 2. Children who had received at least three immunization injections expressed as a percentage of all children aged less than 59 months analysed with respect to the number of times each household had been visited by the field workers (1 to 7 visits inclusive) from Chautara, Syaule, Sano-Siruwari and Pipaldanda.



Uptake of Services: Are there better results after more visits?

In order to assess the effectiveness of field workers' household visits, data on the uptake of health services were re-examined with respect to the number of times each child had been visited. Table 2 shows the results of this visit analysis for Pipaldanda. They suggest that increases in the number of visits made to each household by a fieldworker are associated with considerable improvements in the acceptance of immunization for children, clinic registration and family planning services.

Uptake of Services: Are there differences between panchayat wards?

Figure 2 shows immunization data for several panchayats that have been analysed with respect to numbers of field worker visits made to each household. There is a clear trend for immunization uptake to improve with increasing numbers of visits in *Syaule*, though rate of improvement is less than that found in other *panchayats*. This information alerted supervisors, and the project managers found difficulties being encountered by field staff in Syaule.

Uptake of Services: Are there variations in the uptake rate for different services?

Figure 3 reveals that the uptake of family planning services by households improves as they receive increasing numbers of visits from field workers; the rate of increase appears to be more gradual, and to commence later than that for immunization.

Impact of Services

The system provides a limited amount of information on programme impact. There was little change on children's nutritional status though some alteration in patterns of child deaths. However, its value to managers was to give disaggregated information about service uptake: it was not designed as a system for evaluating impact.

Three Monthly Community Surveillance: Children Aged 0-5 Years

WARD	0	0	0	0	0
VISIT NUMBER	1	2	3	4	5
FILENAME	PDAN 0V1	PDAN 0V2	PDAN 0V3	PDAN 0V4	PDAN 0V5
FIRST MONTH					
LAST MONTH					
Number of families in study	229	170	136	110	75
FAMILY PLANNING:					
% using family planning	3.93	7.05	8.82	8.18	12
VITAL EVENTS:					
Number of births last quarter				0	0
Number of deaths last quarter	0	0	0	0	0
Number of children (0-5 years) seen	307	241	186	153	123
% registered at clinic	41.36	57.26	71.5	81.69	90.24
% well (with no symptoms)	77.19	77.59	74.19	83.66	79.67
IMMUNIZATION COVERAGE:					
Number of children aged 0-35 months	228	176	126	98	68
% children with no immunizations	65.35	47.72	28.57	13.26	4.41
% with at least three immunizations	10.96	25	30.95	40.81	61 76
NUTRITIONAL STATUS:					
Number of children aged 12-59 months	200	164	159	151	118
% with green armband (> =13.5cm)	56.5	60.97	58.49	60.92	70.33
% with yellow armband (12.5cm - 13.5cm)	29.5	31.09	32.7	32.45	26.27
% with red armband (<12.5cm)	11.5	7.31	8.17	6.62	3.38

Table 2. Data From Pipaldanda Panchayat Analysed With Respect To The Number Of Times Each Household Had Been Visited By The Field Worker (1 to 5 Visits Inclusive)

Planning for the Future: What has been achieved so far?

Results suggest that MCH/FP field workers who have received skills training in health education and the rudiments of first aid and diagnosis are better able to motivate Nepalese families to utilize primary health care services than those who have not.

Planning for the Future: Can we evolve sensible "targets" for service delivery?

The data from areas that were kept under closest supervision provide information that may be of use both for setting targets for -- and then evaluating -- the performance of field workers. For example, the percentage of children aged 0-3 years who have received no immunizations should fall -- initially -- by 15% per year; the acceptance rate for all family planning methods should rise by at least 5% per year.

Issues that had to be Faced

The Design of the System

> It is essential to have discussions and negotiations between information users and data collectors before the system is established.

Precise definition of **what information** is needed, **from whom**, over **what time frame**, and in **what format**: (a) permitted concentration on an **absolute minimum of data items** that were considered useful by field workers, and (b) provided clues as to the most appropriate types of computer software to be prepared. Rigorous attempts were made to limit the range of data collected to the absolute minimum needed.

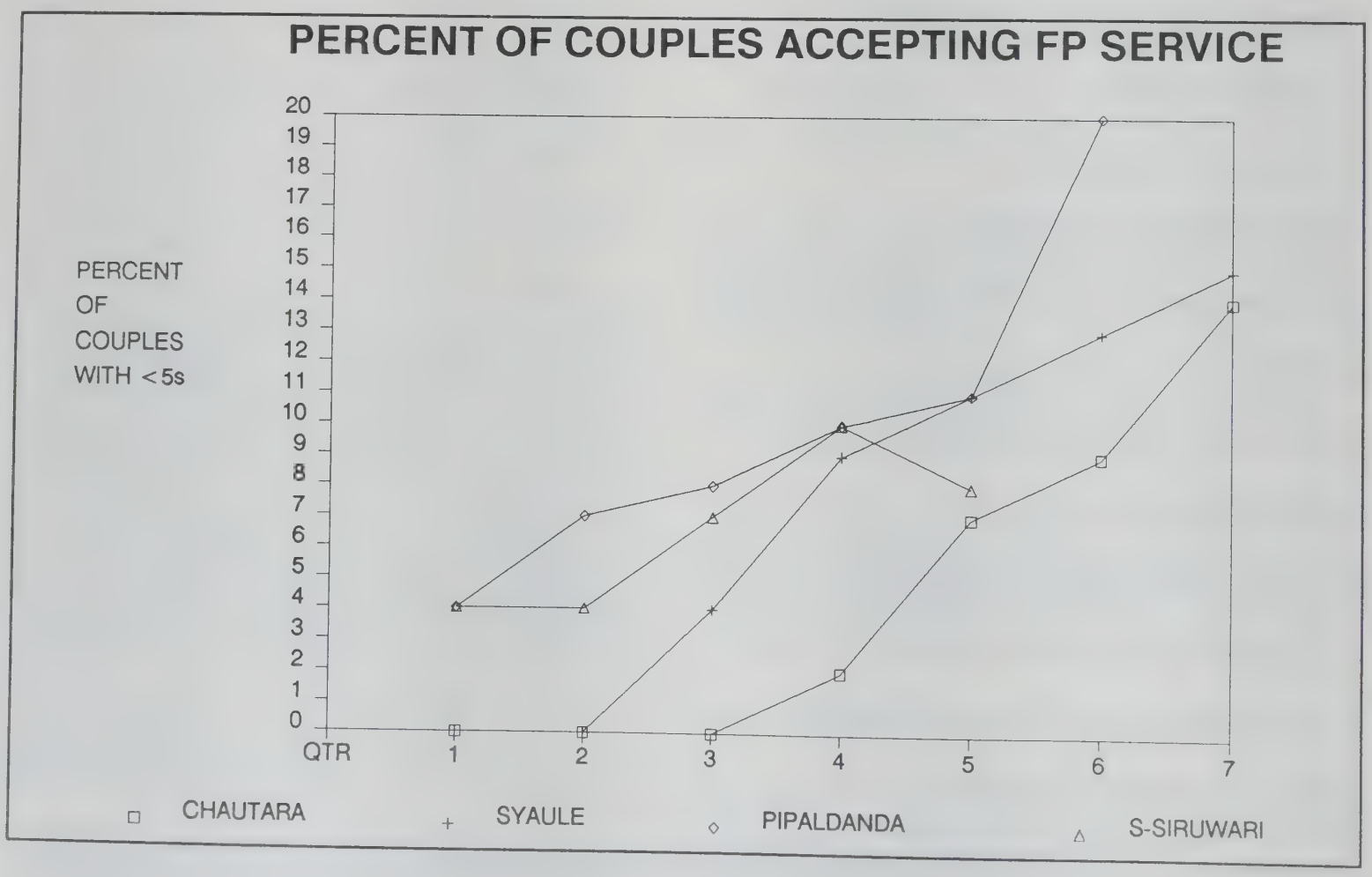


Figure 3. Couples who have accepted family planning services expressed as a percentage of all couples with children aged less than five years analysed with respect to the number of times each household had been visited by field workers from Chautara, Syaule, Sano-Siruwari and Pipaldanda.

It was important that the data needs featured prominently in field worker and supervisor training programmes: we did, however, take care to ensure that "data focus" did not encourage field staff to evolve a highly selective pattern of health care delivery.

Computer Hardware and Software

Manual data sorting would have been extremely time consuming and subject to sizeable errors even when summaries were being prepared for single *panchayat* data each quarter.

> The use of a computer not only permitted rapid and (usually) error-free sorting, it also permitted the disaggregation which was vitally important to make the information useful for managers and field workers.

Analysis by visit number would have been extremely difficult using manual methods.

The speed with which the computer facilitates the summary of data means there are few opportunities for field workers to be uncertain of the value of their work.

Despite a range of safety features, the computer sometimes did go wrong, often in the middle of lengthy computations. Newer, more robust and better protected machines may reduce such problems but, because the entry of data can sometimes take surprisingly long, it is important that clerical staff be trained to undertake data entry and to operate data-processing software. It is inappropriate for such tasks to be undertaken by senior staff even though they may wish to spend considerable periods of time computing.

Maintenance of the system in Kathmandu has proved comparatively easy; skilled engineers are now operating from a variety of commercial concerns. The major problem faced is with obtaining spare parts.

dBase II, and now dBase III, has proven to be ideal software, though it really only became useful once those developing the system learned how to use the language to get it to do what was wanted.

The Operation of the Information System

The validation of service data is always difficult because of uncertainties about data reliability and about possible biases introduced by missing cases. The data collected in Sindhupalchok were no exception. Similarly, interpretation of results was complicated by seasonal factors and possible cohort effects. Analyses which disaggregated data by geographical area, service provided (or condition studied) and visits received by households proved invaluable to managerial and field staff when trying to interpret trends in the uptake of health services.

The managers -- and field workers -- found the results produced through the system to be very helpful. However, the system itself still caused a few headaches even after it had been in use for several months -- mostly because of hardware difficulties. This caused some of the system users to have periods of frustration; not all of them were sufficiently familiar with the software to be able to work around hardware difficulties as they emerged.

GUIDING PRINCIPLES

Computers make it possible for us to consider automating a large number of repetitive tasks -- including those associated with establishing management information systems for health care. However, there are many steps involved in converting the idea into a useful reality.

Initially, perhaps, the information may be a *single user* technology -- viewed by others as a toy or gadget. However, it should, before long, be evolved into a *system* that can be used by others, and well tested so that they do not perceive it to be a troublesome nuisance. Once the system is foolproof, it must also be *accepted* by its users: they must perceive it as valuable, and useful. **Indeed, they should make regular use of it as a tool for management decision-making.** Ideally, the system is not only used, it is also liked and advocated by its users. The alternative -- a system that is not liked, that creates dependency or that is simply not accepted or used -- is a waste of money and the effort put into its development.

People are inclined to develop useful systems if they perceive that the systems are flexible and

responsive and if they perceive that they have some control over their performance. **One must be concerned with helping users of information to evolve flexible, accessible and controllable systems, while encouraging them to gain control of computer technology and helping them to see the tools -- both microcomputer and management information system development -- as useful to them**. Individual information users should not be locked into rigid systems created by others, with lack of control, inflexibility and no ways of changing the way the system behaves. The challenge is to develop these principles into teaching programmes and functioning information systems.

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Hugh Annett was Health Planning Adviser to the Ugandan Ministry of Health, seconded by AMREF from September 1984 to August 1987. Eva Nebeta is AMREF's Systems Analyst who functioned as short term adviser to the HPU.

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Susanna Graham-Jones coordinated the SCF group based at Chautara between 1982 and 1985. David Nabarro worked as the SCF Regional Medical Adviser for South Asia during this period.

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Opinions expressed in this paper are those of the authors and not of any organizations with which they have been connected.

A Nepalese health worker walks to a village in the jungle to collect data for a survey. Photo by A. S. Kochar, World Health Organization)

Microcomputers as a Means to Introduce Effective Management Procedures in Primary Health Care: The Haiti Experience

Paul Auxila and Jon Rohde, Management Sciences for Health

In 1980, the Haitian Ministry of Public Health and Population began a $35,000,000 five-year project supported by the United States Agency for International Development (USAID) to expand and strengthen the Rural Health Delivery System of Haiti. Planners gave a high priority to the development of central management systems needed to support, pay and supervise the staff of roughly 10,000 employees working in over 350 institutions throughout the 15 sanitary districts of Haiti. This paper describes how simple microcomputers were used to improve acceptance and use of standardized administrative procedures in the Ministry of Health.

Early introduction of computers, even prior to implementation of smoothly operating manual information systems, can accelerate the process of improved management in a primary health care programme.

Seven of the nine full-time technical advisors recruited through a contract with Management Sciences for Health (MSH) were assigned counterparts in the Ministry of Health (MOH) to work on key areas of management and administrative procedures. Over the course of the first year and a half of project implementation, situation analysis was carried out in the areas of general administration, personnel, budgeting and finance, drug supply and logistics, inventory, transport and health information systems. Standard procedures were identified and explained in printed manuals, memoranda and during the course of numerous training seminars.

Although the design of these systems followed fairly standard patterns and were technically sound, extreme laxity characterized implementation, resulting in little impact on improved management and administrative practices. Administrative procedures were followed only as long as convenient; and management was by exception rather than by rule.

Frequent changes in Ministry personnel further complicated the training efforts of the technical assistance team, requiring orientation and new training of administrative staff who were often more concerned about political implications of administrative decisions than they were about adherence to established norms and procedures.

By 1982, with the reluctant consent of MSH systems analysis and information system specialists, the technical assistance team decided to try the introduction of microcomputers as a strategy to obtain improved adherence to administrative norms and improve management decision-making. While any introductory book on management information systems clearly states that computers should be introduced only after management systems are fully designed and administrative norms and procedures clearly defined and in use, in this case the **microcomputer was viewed as a tool and incentive for compliance to administrative norms and procedures**. While theory states "If there is no standard accepted manual system, do not computerize", the completely opposite approach was used in the belief that **where standard procedures are not followed, well designed computer programmes may well provide a strong incentive and force adherence to the standards**.

Certainly there were grave doubts about this iconoclastic approach. The Ministry had always processed information manually to the extent that it was processed at all. Real property inventory was kept on a massive array of cards and retyped whenever reports were needed. There was no single record of the 10,000 employees, their pay, their localization or any of their characteristics. Annually, tens of thousands of morbidity and mortality report forms were processed manually to

provide crude reports to the Pan American Health Organization (PAHO). Although individual books were apparently kept for each of many bank accounts, a unified budget and periodic budget reckoning were yet unknown.

Resistance to any change in this system was predictable and high. For some employees, there was simply the fear that the computer would take their jobs, and for others, the inherent laziness at learning new tasks. For others, was the clear desire to retain the existing system as the lack of knowledge and readily, retrievable data was in itself a power base for various people within the Ministry bureaucracy. Importantly, a few key personnel at higher levels of the Ministry could foresee that with adequate management information, better decisions could be made and a reallocation of existing resources would allow more effective use of Ministry budgets, monitoring of its resources and evaluation of its impact. It was on these few visionaries that success of the system really rested.

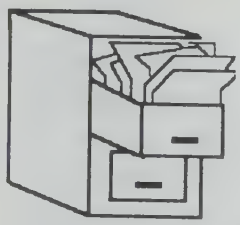
The choice of equipment, in spite of the wide array of powerful computing hardware available in 1982, was relatively easy: the simplest system that could be obtained with local support, maintenance and rapid service guarantee was selected. Only Radio Shack was prepared to provide such service in Haiti at the time, so a Radio Shack Model-II with 64k of memory, a disk drive expansion unit and a Radio Shack Line V printer were chosen. Soon afterwards -- as demands on the system for both data entry and file management rapidly mounted -- two more computers, another printer and an 8 megabyte hard disk were added.

In the absence of a comprehensive system design, a series of subsystems that would provide a database to be eventually tied together through a common data field was developed. The central system became the health establishment inventory, a first ever, complete listing of all health facilities in the country: government and private, curative, preventive and supportive. Starting from a list of establishments known to be located in each of fifteen health districts, the fifteen lists were repeatedly sent back to the periphery for revision, upgrading, and correction. Establishment name, localization, staffing patterns, building ownership, state of the building and indicators of its use were recorded. Unique numbers were assigned to each establishment based on the census enumeration district in which they were located. Eventually, field visits to most of over 600 establishments were necessary to gather and refine data.

Progressively, other categories of information were added: population covered by each establishment, existence of refrigeration, drug storage areas, and so on. People asked for far more information than could be supplied, including inventory of real property, state of vaccines and medical supply, and actual data on the use of health establishments. This led to the development of new database files. Meanwhile, the establishment list became the central data file for all other subsystems.

INVENTORY OR PROPERTY CONTROL

The existing list of real property had long been in total disarray and efforts to reorient using a cardex system were confused by lack of standard categories, absence of price data, source of inventory and most impossible of all, huge quantities of items of insignificant value such as calendars, ashtrays, letter openers, etc. No data were kept on the exact location of the items and no standard vocabulary was used in their description. Cross analysis was impossible and there were no norms for the continuous updating of inventory for new purchases or transfer of existing items. Every year, a complete physical inventory was retaken and an entire new list of the Ministry's possessions was retyped. The typical desk to be found in a Ministry office had four, five or even more numbers crudely painted on its side and crossed off reflecting repeated efforts to record even a large stationary item.



The computer made simple the work of a system previously in total disarray.

Since the health establishment file already existed with a unique code for each establishment, a file was created with one record for each piece of property of value in excess of $50, showing a number, exact location, a standard description, date of purchase, estimated value, and so forth. To improve standardization, the computer programmes were prepared to control data entry. With set questions placed on the screen, these programmes would allow only accepted terms and format to be entered for each item. This automatically forced the operator to enter the inventory data in a standard and consistent manner, making cost analysis of data and grouping of equipment easier and more rapid.

A chair, for instance, could be classified only as "chair"; "stool", or the more cosmetic description "seating device", would not be accepted by the machine.

The computer is readily capable of sorting its own files to seek donated material, to list all air conditioners, to identify objects valued at over $1000 or to list typewriters aged more than ten years, and similar useful manipulation of a previously dead data set. People now understand the purpose and use of inventory, with consequent great improvement in the validity of the data obtained, its entry and the updating of the files.

An initial task of the technical assistance team had been an inventory of all vehicles working in the health system throughout the country. This inventory required extensive time and travel to locate, examine and characterize more than 150 vehicles. The constant movement and reassignment of these vehicles was not tracked in an organized fashion, necessitating periodic time-consuming revision of the inventory. In short, the vehicle list was never up to date. Unless a vehicle was parked in front of the Department of Health, its localization within the country was always uncertain. An extensive series of maintenance and repair forms, trip tickets, monthly report forms and maintenance records was designed and prepared but irregular use of these forms in the absence of central files rendered them largely useless.

A computer file was established with the objective of making available complete data on each automobile. Cars were provided with a unit number painted on their side, making their identification, even while moving, possible. By knowing the make, type, year of manufacture, serial number and general condition of a vehicle at last inspection, an appropriate array of spare parts could be ordered and maintenance requirements planned. Although the Vehicle Use Report forms based on the daily trip tickets are not yet in general use, the computer is programmed to keep a running analysis of distance traveled and the type of use reported, e.g., patient transport, supervision of health facilities, logistics and supply activities, administrative activities, and personal use. Gasoline allocation is also reported for each vehicle, allowing consumption calculations with obvious implications for control of this valued resource. Repair records, when entered into the computer file, will allow objective measurement of the expenses of each vehicle and make the process of writing off vehicles more scientific and objective.

The computerized vehicle list is already handling routine work such as planning auto parts orders, assigning gasoline budgets to specific units based on their vehicle fleet, renewal of insurance for the entire fleet annually, development of the maintenance plan and estimates for garage budgets and general characterization of the state of each vehicle in the fleet in order to make new vehicle purchases.

A similar approach was used for control of refrigerators and the cold chain for vaccines. Refrigerators are now standardized, a stock of spare parts is available, and a clear picture of where new refrigerators should be placed makes decision-making easy and effective.

PERSONNEL

With personnel expenditures representing over 80% of the Ministry's operational cost, efficient management in this area is a major cost-reduction strategy.

No unified list of personnel existed and individual files, when they existed at all, were not up to date. There was little adherence to established rules for control of personnel movements and transfers, with considerable duplication resulting in a number of checks printed for a single individual. Because the payroll came directly from the Central Ministry of Finance with checks grouped by administrative unit or health establishment, such duplications could never be identified.

After numerous unsuccessful attempts at hand-sorted personnel lists, a computer file was created through entry of a single month's payroll as received in the Department of Health from the Ministry of Finance. The master list was sorted alphabetically by name making it possible to identify duplicate checks. **The duplicates eliminated saved enough money in one month to pay for the entire cost of the computer's hardware, software and its operating personnel for more than ten years!** Obviously, not everyone was pleased with this remarkable result, and more than one year of neglect of the computerized personnel and payroll file passed before strong encouragement from various donors stimulated the Ministry to once again bring the personnel payroll list up to date. It is now being used for analytic work, determining not only the name and salary of each

individual but also the functional title and the distribution of manpower by specific health establishment throughout the country. Job titles have been reduced from more than 500 to a standard list just over 100, allowing analysis of functional categories. Matched against the planned personnel distribution based on a standardized personnel roster for each level of the health establishment inventory, the process of slowly transferring individuals to better conform to the expected personnel distribution has begun. This, at last, allows forward planning on manpower development and distribution.

Given the limited list of functional titles, clear and specific job descriptions have now been written against which annual evaluations can be carried out. Individual files on the computer will now carry information on birth date, initial employment with the Department, educational experience, in-service training and the work experience of each employee in the Department. Proper use of this extensive system for all 8,000 regular employees plus 2,000 temporary personnel will require months (or years) before it is smoothly functioning, but **the computer has made personnel management at last a possible reality and one which promises to save millions in the health sector** -- money which is better allocated to the cost of providing better health care.

ACCOUNTING

There can be no doubt that the most important and most sensitive area of management has to do with money. From the outset, a multiplicity of accounts, different budgets and budgetary formats and flexible disbursement procedures made fiscal analysis and regular accounting almost impossible. A detailed budget for project expenditures was prepared each year as prerequisite for the release of money, following which little attention was paid thereafter to budget details. There seemed to be a constant imbalance of funds, with some units or divisions of the Department spending 300% or more of their budgeted amount while others did not even receive 10%. A constant state of stress with donor agencies as well as within the Department substantially impeded planned project activities.

During fiscal year 1984, the detailed budget for the Rural Health Project was programmed onto the computer -- maintaining a record for each budgetary rubric, over 250 in number, tracking obligations and expenditures for each item, and producing monthly and quarterly reports showing percentage spent and amount remaining in each category. This allowed close control of bank account balance and rates of expenditure in each budget activity category. Predictably, this budget accounting record was deemed by some to be too "inflexible" and was initially abandoned by the Department. A year passed with virtually no budgetary control and disasterous results. Accordingly, during the past year, a financial control system has now been implemented in the Northern region with computer programmes that force the use of entry of budgetary data allowing appropriate accounting and budget reckoning prior to printing the record from which a check will be issued by the regional accountant. Eventually, the computer will write all checks and will be programmed in such a way that a check will be prepared only if the proper data is entered indicating budget, budgetary rubric, authorized person to requisition from the rubric, adequate bank balance in order to cover the expenditure, and so on. **Thus, the computer can encourage and enforce proper budgetary and accounting procedures while making financial records and record keeping far more effective, easy to use and accurate.**

STATISTICAL AND HEALTH REPORTING SYSTEMS

At the start of the Rural Health Project, national mortality and morbidity data were rarely available in consolidated form until two to three years after they were collected. Collated and analysed by hand, they were incomplete, unreliable and of extremely poor quality. Information on health status was out of date and of little use in decision-making. Extensive irrelevant data was collected and the manual classification of a huge volume of forms made most of it useless.

The computer was first used to prepare data entry programmes for deaths and morbidity reports from the nation's hospitals -- with a classification of data and printout corresponding to report formats of PAHO, the major consumer of such MOH data. Now that the classifying work at the central computer can be done in fifteen days instead of eight months, more attention can be given to management problems such as the lack of training in disease codification that became obvious after the first reports were printed. Faster feedback to lower levels increased their response

in the reporting system, and statisticians could turn their attention to the future and improvement in the quality of data rather than wrestling with mountains of paper inadequately describing the failures of the past.

More recently, after two years of analysis and discussion, the monthly reporting system of all health establishments has been consolidated, ranging from village-based community health workers through dispensaries and health centres to the hospitals. Traditionally, every unit in the Central Ministry had decided upon its information needs and prepared forms that field establishments would have to fill out monthly or sometimes even more frequently. At different levels, ten, twelve even sixteen monthly report forms were required. There was a great lack of compatibility between the forms, and the definitions between one programme and another were often mutually inconsistent. Personnel, naturally reeling under the weight of record keeping and reporting, did a poor job in data collection and were unreliable in the submission of reports. In view of the unreliability and the tardiness of report submission, central sections tended to be extremely delayed in making consolidated reports, most of which reflected less than 25% of health establishments in the country.

Patient services are recorded by clinic visits, bed occupancy and community activities. Ancillary services such as radiology and laboratory support submit only the total number of exams performed. The report concludes with a summary of receipts and expenditures of the past month which gives a complementary view of health service utilization as well as administrative cost. These forms have been programmed into the central computer to allow rapid data entry and the production of unique reports for each of the country's programme areas, by district, region and health establishment to ensure feedback within a month of the reporting period.

The development of a unified form consolidating key indicator information from each programme consumed more than one year of regular meetings. This work, however, has resulted in a single set of monthly report forms that are compatible across the different levels of health establishments and provide critical indicator information for each major health programme; thus, community agents, dispensaries, health centres and hospitals all report on a similar selection of uniformly standardized diagnostic categories and indicators in each of the six health priority areas in the national public health programme: diarrhoea, immunization, nutrition, family planning, tuberculosis and malaria.

Changing a Ministry's lifetime behaviour in health statistics is certainly no easy job. The first step was to take a chance, develop forms, write computer programmes and run them with fictitious data presenting sample reports to the key personnel in the Ministry. Once they saw how easily and rapidly the data could be processed and how useful the resulting reports, in spite of the limited number of indicators, strong support was obtained from many parts of the Ministry.

Particularly desirable was the rapidity with which up-to-date information could be obtained and used in supervisory visits as feedback to the lower levels. The computer and its inflexibility in data processing forced absolute standardized definitions and categories of activities.

This inflexibility prevented many diversions proposed and eventually rejected by the many different consumers of health information in the Ministry.

The forms are now printed, the computer system in place and instructions for the entire system have been prepared. All health workers in the country require training on the use of these forms and their timely submission. Instructions from the Director General have indicated that when new forms are provided to an establishment that all existing and previous forms should be collected and destroyed on the spot, thereby dramatically demonstrating the intention to make the new form the unique and only acceptable one. Submission of monthly reports as a prerequisite for receiving pay checks has also been proposed, although such draconian measures are unlikely to be enforced, at least in the early months.

The system is designed to be useful to the user himself. Supervisors have been instructed to display in a graphic format the key indicators shown on this form and to carry out supervisory evaluation and instructions based on the results.

With computerized data processing, rapid feedback is possible and the information system not only monitors, but at the same time, stimulates improved performance throughout the entire health system.

CONCLUSION

While this paper has presented an overview of the use of microcomputers to introduce improved management information systems in a Third World Ministry of Health, it is important to note that **the introduction of the computer was part of the strategy to improve adherence to administrative and managerial norms**. The approach of the developed country to computer introduction might never have worked in Haiti. Had the detailed system design and the smooth functioning of an existing manual system been regarded as a prerequisite, many more years could have passed with ad hoc decision-making based on the lack of information. The ultimate goal was not to introduce computers per se but to improve the old planning and control processes of management.

The computer was and remains only a tool, a tool that successfully caught everyone's attention, a tool that showed how fast data could be processed and how much relevant and useful information could be obtained from even the data already available.

The computer improved efficiency, made work easier and created a certain addiction, a dependency on improved information on the part of all who used it.

Workers who used the computer looked better -- they were complimented and praised. Finally, the tool is dumb enough not to be able to think in flexible ways and therefore forces standardization and adherence to established administrative norms and procedures.

While resistance and difficulty is encountered at various stages in the introduction of computerized information systems, a critical element of the success of these efforts is the support of key decision makers in the Ministry of Health and their willingness to force the difficult decisions that would allow objective, effective data processing and report generation to become the norm. It is because of perserverance, interest and hard work that one Ministry in Haiti is now benefitting from the information revolution.

Analysis of Four Case Studies on Management Information Systems and Microcomputers in Primary Health Care: Aga Khan Network Experience in Bangladesh, Kenya and Pakistan

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Barbara E. Echols, Duke University Medical Center

BACKGROUND

The strategy of the international workshop on Management Information Systems (MIS) and Microcomputers (MC) in Primary Health Care (PHC) was that it should be experientially-based and be guided by experience and issues emerging from several Aga Khan network-supported PHC projects. Four such projects were asked to conduct self-administered assessments of their own MIS and their use of MCs with the aim to identify problems encountered and to describe solutions attempted. The four PHC projects are:

- Aga Khan Community Health Programme in urban Dhaka, Bangladesh
- Kisumu Primary Health Care Project in rural Kisumu, Kenya
- Urban Primary Health Care Programme in Karachi, Pakistan
- Vur Primary Health Care Project in rural Sind, Pakistan

The four projects share a PHC orientation that reflects the health-for-all strategy: the programmes are community-based, they aim for universal coverage and they conduct health surveillance. There are, of course, differences in the implementation of these principles. Two projects, for example, saw community involvement as a prerequisite for programme development; the others focused on community participation at later stages. Most projects concentrate on the maternal and child health services for high risk children and women as their populations, while one addresses health problems of the entire community. Health surveillance is based mainly on home visits, the periodicity of which ranges from one month to one year.

Two projects operate in largely deprived urban areas and the other two target underserved rural regions. The size of the population to be served by the projects ranges from 12,000 to 60,000. By mid-1987, one project had "covered" its entire catchment area, but had not yet implemented the full spectrum of planned activities. The urban projects serve communities of considerable

The Aga Khan Community Health Programme in Dhaka emphasizes health education of women and children; thus, its microcomputerized MIS monitors changes in health knowledge, attitudes, and practices. (Photo by Jean-Luc Ray, AKF)

socio-cultural diversity, while the rural target populations of the other two projects tend to be more homogeneous.

The scope of interventions provided by each project is similar. As one would expect, all of the projects include growth monitoring, oral rehydration therapy, treatment of common diseases, nutrition education, immunization, and other maternal and child health/family planning (MCH/FP) services, dispensing of basic drugs, health education, and training of community-based health workers.

One rural project gave considerable effort to promotion of safe water and environmental sanitation, and of income generating activities. The timing and intensity of launching specific PHC activities varied from project to project. All of them relied on community health workers who operate in individually designed areas. Their roles differ somewhat, partly because of local gender restrictions. Health professionals serve as supervisors, health care providers, and managers. Service sites in all projects include community health centres, satellite and mobile facilities and visits to the family home. In each project area, other service providers operate as well, mainly private practitioners and government agencies.

All four projects have begun to develop computerized information systems. They draw on both routine records and survey data, but the balance of these sources changes over time and differs between projects. All have conducted baseline surveys and have introduced some version of a household record which is to be regularly updated. Routine service records are in various stages of development, testing, revision or use. Information content of each project's data base is similar but there are considerable differences in the way specific data items are obtained. All projects are making special efforts to satisfy the data requirements of AKF which will use the various data sets in a comparative analysis of results at the turn of the decade.

Microcomputers entered the information systems at different stages, at the early design phase in two projects and at fairly advanced operational phases in the other two. In the first two projects, data collection and data processing are well integrated but their body of data is as yet relatively small. The other two projects, being older, have a richer data base but computerization is incomplete due to a large backlog.

Members of the Kisumu PHC Programme management team discuss health records and the types of data most useful to them in their effort to support community-based health care initiatives in the area. (Photo by Jean-Luc Ray, AKF)

METHODS

The Workshop Steering Committee determined that the self-assessment should apply a certain process, following uniform guidelines (Table 1), as the most productive way to document and compare/contrast each project's experience. The Steering Committee outlined the scope of the guidelines which were subsequently developed in detail by two of its members (the authors of this chapter). A draft was field tested in two of the projects during early May, finalized at AKF headquarters and distributed to the projects later that month. Members of the Steering Committee assisted each project, at different stages, in the development of the reports. The authors compiled a detailed point-by-point comparative summary of the reports for review by the Committee and outlined major issues concerning information systems and computer applications. After discussion in the Steering Committee, the authors prepared an aggregate review of the self-study reports for inclusion in the background material that was sent to all workshop participants. This chapter is based on the review paper.

All four case studies reflect a thorough effort to be responsive to the guidelines. There were, however, discrepancies in the interpretation of terms and the application of concepts. For instance, the roles of objectives, indicators, and targets in decision-making were set out in some reports less clearly than in others. The problem was compounded by the fact that the guidelines did not provide definitions of terms and the intent

Table 1. Scope of Guidelines for Self-Study of AKF Supported PHC Projects

Project Objectives and Characteristics

- Major Objectives and Targets
- Priority Activities and Linkage to Objectives and Targets
- Definition of Population Covered
- Approach to Achieve High Coverage
- Utilization of Services
- External Services Utilized
- Definition of Target Population
- Identification of High Risk Groups
- High Risk Group Interventions
- PHC Activities by Order of Priority
- Integration of Activities
- Intersectoral Relationships
- Community Involvement in Management
- Community Involvement in Financing
- Community Involvement in Programme Monitoring
- Sponsorship of Project
- Organizational Structure
- Methods of Management
- Total Programme Cost and Per Capita Costs
- Breakdown of Programme Costs
- Cost-Effectiveness
- Achievements and Problems of the Project
- Desired Changes

Management Information System

- Diagram of Information System
- Information Needs at Various Decision Making Levels
- Survey Procedures
- Survey Data Most Useful in Programme Management
- Records and Forms -- Data Uses in Programme Management
- Data Collection
- Data Aggregation
- Periodic Recording of Health Services and Health Status
- Quality Control Procedures
- Most Useful Indicators of Programme Activities
- Most Useful Indicators of Programme Goals
- Data Scales and Data Reporting Formats
- Information Feedback and Data Presentation Formats
- Ten Most Useful AKF Indicators
- Rankings of Indicators and Uses in Decision-Making
- Ten Least Helpful AKF Indicators and Reasons
- Cost Breakdown of Management Information System
- Proportion of Total Project Cost
- Major MIS Problems
- Attempted Solutions and Outcomes

Microcomputer Applications

- Location and Operators of Computers
- Hardware and their Configuration
- Software and their Applications
- Problems with Hardware and Software
- Computer Training of Project Personnel
- Operating Conditions and Problems
- Computerized Data Items and Rationale
- Coding Procedures and Data Entry
- Skills of Data Entry Personnel
- Quality Control and Role of the Computer
- Computer Uses in Data Processing
- Other Computer Uses in Management
- Uses Other Than for Management Information
- Distribution of Computer Time
- Most Useful Microcomputer Applications
- Disappointments with Computer Applications
- Hardware Costs
- Software/Other Computer Related Costs
- Advantages and Limitations of Microcomputers
- Problems with Introducing Microcomputers into MIS

Recommendations -- Problems, Solutions, Lessons

- Development of Information System
- Use of Management Information
- Function of Microcomputers
- Selection and Uses of Software

of some questions was not always evident to the responders.

RESULTS

This section summarizes the experience of the four projects. Major elements and functions of management information systems and microcomputer applications are described, followed by an overview of reported problems and solutions in each of the two areas.

Management Information Systems

Information Needs

The projects were asked to list information needs at the various levels of management. At the macro level, the emphasis is on programme costs and impact, while coverage and performance indicators lead at the lower levels. Information needs of strategic decisions tended to be defined more clearly than those of needs of operational management.

Data Sources

Surveys, health records and activity logs are the major sources of data. Some projects use less-structured information, such as problem lists established by village committees and observations by health visitors. Surveys use both census and sampling approaches with the latter covering about one in four households. All projects have some kind of comprehensive family record, either kept at home, by a health visitor, at a project centre or a combination thereof. Record forms show great diversity; their number, design, and data format frequently do not facilitate efficient data processing, in the judgment of the reports.

Data Management

Each project is served by an information unit; in two cases these units serve other constituents as well. They are the primary sites for data processing, including quality control, aggregation and analysis. Most projects expressed concern about the accuracy and completeness of data and stressed the importance of supervision, especially at the level of data collection. Data summaries, reflecting specific information needs, are or will be, prepared for various managerial levels. Most projects provide only limited feedback, particularly to the community level. One project was able to estimate its data management costs, amounting to about one-tenth of the total project budget.

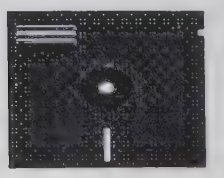
AKF Indicators

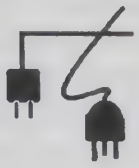
The projects were asked to assess the utility to management of AKF's "standardized indicators" and to identify their contributions or limitations with respect to management needs. This exercise aimed to document the extent to which these indicators are useful for management purposes, recognizing that they were developed for AKF's envisaged comparative analysis and for purposes of monitoring and evaluating (not managing) PHC programmes. The listings of "most useful" and "least helpful" indicators revealed considerable differences of opinion. Only two indicators, the infant mortality rate and the proportion of one-year old children who are fully immunized, were rated positively by all four projects. Another five received a positive rating by three projects and no negative ratings, while eleven showed a positive balance of "most useful" and "least helpful" ratings.

Opinion was equally divided on seven indicators and sixteen showed a negative balance (Appendix B1 presents the 41 AKF indicators grouped according to the case study ratings). "Least helpful" ratings were explained in terms of difficulties in obtaining the necessary data or lack of relevance to project activities. Reasons were given for positive ratings of indicators but in most cases their specific uses in managerial decision-making were not detailed.

MIS Problems

Major problems reported in all four management information systems include: **limited appreciation of the utility of management data at all levels**; **insufficient definition of programme objectives and activities**; **lack of proper designation of targets and indicators**; and **poor quality, regularity, and completeness of data collection**. Thus, MIS problems tended to relate more strongly to management style and operations than to features of the information system itself. Among the most frequently mentioned solutions were training of and feedback to data providers, better record design and supervision, and improved quality control procedures.





MICROCOMPUTER APPLICATIONS

Hardware

Of the six microcomputers planned for the study sites, five were already in active use: one IBM-PC, two IBM-XTs, and two IBM-ATs. Though equipment problems have been minor, they pose a potential threat to at least one project because of unavailability of local service.

Software

All projects use commercially available software: database managers (dBase III Plus, DataStar), spreadsheets (Lotus 1-2-3, Symphony), analytic packages (SPSS/PC+, McPDA), and word processors (MultiMate Advantage, WordStar). The only problems incurred have related to user training; there have been no actual software failures.

Operating Conditions

All of the projects are faced with problems of erratic power supplies, high humidity, heat, and dust; air conditioning and auxiliary power appear to address these issues satisfactorily. An unresolved problem for one project is the persistent presence of ants.

Principal Operators

The systems are operated by a variety of community volunteers and project staff. Personnel turnover has led one project to do extensive software customizing; this has facilitated easy access to the system by inexperienced users but could pose a problem should programme changes be required.

Data Selection and Entry

A variety of data are entered into the systems: sample surveys, census, community health worker training registers, staff files, indicators, immunization rosters. Some projects use interim off-site aggregation and/or coding; others transfer the data directly from the collection forms to the computer.

Quality Control

Quality control procedures include random record review, data review prior to and at time of computer entry, and computer error-trapping routines. The potential for increased data accuracy is seen as one of the major benefits of computerization.

Computer Uses

All of the projects use, or plan to use, the computer to generate management indicators and AKF's "standardized indicators". At present, only one project uses the computer to generate the actual report; otherwise, the computer is used to tally and analyse the data for insertion into an independently derived format. The data entry and processing associated with the indicators requires one full-time computer per project. This has posed a problem for some projects, leaving little or no time for other computer activities such as financial accounting, inventory control, word processing, training, research, simulation, curriculum development, student projects. Planned for the future are resource allocation, epidemiological research, and feedback to field workers.

Costs

It is primarily the up-front costs of the microcomputer that were of concern. Computer hardware requires a large initial capital outlay -- one that is often compounded by high duty charges. Salaries are the second greatest expense. Software ranged between $2,000-3,000, maintenance and operation $1,000-2,000, and supplies $1,000-2,000.

Microcomputer Problems

A variety of problems have been experienced in the introduction of the computer: long waits for the hardware, technical difficulties, management resistance, unrealistic turn around expectations, determination of extent of computer usage, loss of staff motivation due to slow feedback in early stages, misconceptions about use of data, and breakdowns in MIS due to detailed requirements of data entry. Nonetheless, the only anticipated benefits of computerization that were reported as having proven disappointing related to insufficient computer time for activities other than database management. Increased data accuracy, speed, variety, storage, and sophisticated analysis were all seen as benefits of the computer which could facilitate improved decision-making.

RECOMMENDATIONS

The projects were asked to summarize major lessons learned with respect to management information systems and microcomputer applications. A number of the recommendations made for strengthening management information systems have general applicability:

- **establish clearly stated objectives and targets,**
- **promote collaboration of PHC and MIS staff,**
- **determine essential information needs,**
- **designate appropriate and practical indicators,**
- **involve the data collectors in record design,**
- **provide ongoing training and useful feedback, and**
- **use microcomputers which are locally compatible.**

There was almost unanimous agreement on factors which enhance the usefulness of computers in MIS for PHC: acceptability, access, training, maintenance, quality and timeliness of data, and data appreciation. Most projects felt that the computer had an important role in monitoring worker performance and in programme evaluation.

Seen as somewhat less important was the role of the computer in data analysis for resource allocation, monitoring provision of services, and monitoring coverage of at-risk groups.

CONCLUSIONS

Interpretation of the case study reports was frustrated on occasion by difficulties in distinguishing between what reflects experience and what represents plans and expectation. In addition, the reports sometimes used terms inconsistently or in ways not intended by the guidelines and, in some cases, did not address certain items of the guidelines.

Two important characteristics of the projects should be taken into consideration when lessons are drawn from their experience: first, the programmes are not yet fully developed and their information systems in particular are in their infancy, and second, even though the projects share a common PHC philosophy, they show great diversity in their approach and emphasis.

Of the three elements in the term "management information system", one, the "management" support function, is particularly undeveloped. This is not entirely attributable to weaknesses of the information systems but also to a managerial attitude that does not value information as highly as it might be valued. The second element, "information", suffers both from too much and too little. Especially in the older projects, components were incorporated which had not been designed to serve a management information function. All projects feel their data base includes much that is not needed for management decision-making while failing to provide certain essential information. Finally, the "system" features of management information are still tenuous. Technical linkages within the data base and smooth articulation between information operations and decision-making processes are just emerging. Decision makers and information officers are not always in concordance with regard to the meaning and uses of data.

There is diversity among the projects in programmatic strategy as well as in information operations. One project places emphasis on ecological intervention while the others give greater attention to personal health care. This, as other programmatic differences between the projects, results in considerable heterogeneity of information content. The balance of continuous and periodic data collection and the mix of surveys, registers, records and logs affect the operation of information systems. Finally, differences in management style influence the role and function of the system.

Projects with more centralized decision-making show a data flow mostly from the bottom up while those with more shared decision-making tend to provide feedback from the top down.

The concerns these case studies suggest, explicitly or implicitly, are not entirely new. Some of them are addressed in the WFPHA Information for Action issue paper, "Technologies for Management Information Systems in Primary Health Care", which was part of the background material for the workshop.

Issues that have been well recognized before relate to **data quality** and the **content**, **use** and **flow** of **information**. Major concerns for quality focus on the degree of **coverage**, **completeness** and **accuracy** of data. The worth of information content depends, among other things, on the validity of the data items, standardization of the measures and comprehensiveness of the information.

Issues of information flow include **timeliness**, **levels of aggregation**, and **feedback**. Major concerns for use of information relate to the value providers and users attach to information, to the contrast between amount collected and amount used, and to the nature and purpose of use.

Issues and concerns that relate to the role of microcomputers in PHC management information systems are covered in Table 2. MIS issues that have probably not received sufficient attention in the past are detailed in Table 3.

Although the self-study process was new to most participants and required a large amount of time, the exercise of conducting the systematic study was seen as highly valuable experience by all projects. It provided an occasion to take a comprehensive look at the programme, to review its goals and activities, to assess its decision-making process and to evaluate its information system. The exercise stimulated a number of improvements in each project, in addition to giving direction to the workshop.

Table 2. Microcomputers (MC) -- Issues and Concerns

MC-MIS Relationship:	Can the microcomputer accommodate varying data collection and processing methods or must the information system be structured to accommodate computer technology?
Size of Data Base:	The computer's processing and storage capacity can lead to indiscriminate data collection and entry; this is a waste of manpower, and information overload can have a negative impact on performance and decision-making.
Quality Control:	MC-based techniques can significantly improve data quality, but they do have limitations. Quality control must start at the earliest stages of data collection and recording and then be maintained throughout the system.
MC Operators:	The more inexperienced the user is, the greater is the need for "user-friendly" software and, in general, the slower is the system. The inexperienced user will also require more backup support.
MC Integration:	Computerization will be inefficient where the MIS is not developed with a clear understanding of the information needed for project operation and decision-making at the various levels of the PHC programme.
MC Roles:	The microcomputer can greatly facilitate timely action and decision-making, but only if there is an appreciation of the data, and the MIS database contains the relevant data.
MC Logistics:	Projects often experience long delays between order placement and equipment receipt. In addition, the government often imposes heavy import fees -- the same as it would levy against commercial organizations.

Table 3. Management Information Systems (MIS) -- Issues To Be Addressed

Systems Design:	To what extent should information systems be shaped from the top down and from the bottom up? How are conflicts reconciled?
Dual Systems:	To what extent and at what levels should the system facilitate manual as well as electronic data processing? Is a single system practical?
Synchronization:	What are effective ways to avoid PHC and MIS falling out of step in their development, in timing as well as direction?
Flexibility:	How can the need for change in PHC services be balanced with the desire for stability in management information systems?
Efficiency:	What factors promote or impede the effective functioning of MIS? Which factors can be modified, and how?
Integration:	How can MIS be integrated in the decision-making process while avoiding that MIS drives PHC?

Overview: Current Perspectives on Management Information Systems in Primary Health Care

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CURRENT SITUATION

The findings from the Aga Khan network case studies are not unusual. Health information systems have traditionally been developed by centralized health statistics or similar offices in ministries of health. They have usually been disease-oriented and hospital-based, and they have been designed to provide national or state level officials with aggregate data for statistical reports. Primary health care (PHC) has often been added to these systems so that health workers and hospitals have been required to provide additional data to the central statistics offices on PHC service activities.

Record-based reporting systems were not designed as management information systems. Nor are they appropriate to community-oriented PHC, in which communities play an active role in designing, operating, and monitoring PHC programmes.

Typically, data requirements, procedures and forms for collecting and reporting data, and targets for PHC activities are all set at the central level. Health workers are required to collect and report these data to the central level on a regular basis. These systems are usually inflexible (they do not allow for local determination of relevant data), require large amounts of personnel time for collection and transmission of the data to the central level, produce massive amounts of data on a regular basis, are incapable of processing or analysing the data, produce incomplete and unreliable summary reports years after the data are collected, are rarely interpreted and used for management of PHC, and feed little or nothing back to the community and district health workers.

Most PHC programme managers realize that these systems are cumbersome, inefficient, a detraction from the provision of health services and of little practical utility. Recently, several national programmes have taken steps to revise their systems to produce something that will be simpler, less time-consuming, less expensive and much more useful. For example, PHC programmes in Burma, Bangladesh and Thailand are currently undertaking studies and demonstration projects to simplify their implementing information systems.

INNOVATIONS AND DEMONSTRATIONS

Bangladesh is pilot testing a greatly simplified "*Integrated Reporting System*" that focuses on a limited number of family planning and maternal and child health activities. A simple analysis plan is being developed as part of the system to allow supervisors to assess the performance of field workers. Guidelines are also being developed to show supervisors how to use this information to develop work plans with the field workers that will lead to improved performance.

Burma is developing a "*Minimal Essential Data*" system that will drastically reduce the amount of data collected on a routine basis. This will be supplemented with "rapid surveys" when additional data are needed for a special purpose. These rapid surveys can be designed and a report submitted within a matter of 2-3 weeks.

Thailand is about to undertake a study to develop and test a decentralized management information system (MIS) that will provide provincial health officers with information that they determine is needed for planning and monitoring their own PHC activities.

All three of these projects are employing microcomputers to process and analyse MIS data.

These are only some examples of work that is getting underway in PHC programmes to develop more practical and useful information systems.

CHALLENGES AND OPPORTUNITIES

This workshop has assembled a broad range of individuals with both practical and technical experience in MIS, PHC and computer technology to explore ways to improve PHC management information systems and to propose appropriate ways to use microcomputers. There are several global issues that this workshop is addressing on a priority basis.

Community-Based MIS

Communities are not usually involved in MIS, except as respondents to surveys and providers of information for health records. But PHC is based on a central principle of community participation, including participation in the planning and monitoring of PHC services. This requires information on community PHC needs and community use of that information. Is a community-run MIS feasible? What would such a system look like? How would it contribute to the national and district/provincial need for information? Would a community level MIS run by health post staff be more feasible? What would a feasible, community-based MIS model look like?

MIS for District Health Systems

Most MIS are centralized at the national level, but there is a movement underway to decentralize to the district level. What would a model district information system based on PHC look like? Could it replace the centrally-designed MIS and thereby reduce the overall workload of health workers at the periphery of the system? What's the best way to design a MIS, from "the top down", or from "the bottom up", by revising what exists or starting from scratch?

Most "information systems" are designed as data collection and reporting systems, with little or no attention to analysis and utilization. The emphasis has traditionally been placed on selecting indicators and then designing forms to collect data on those indicators. But a decentralized MIS is different.

A decentralized community-based MIS requires that local managers would specify local PHC objectives and that the MIS would collect information to enable those managers to track performance on locally-defined PHC problems and priorities, activities and achievement of local objectives. This would require a completely different approach.

How would such a system satisfy the competing demands of the national level for standardized information for aggregation and comparison, and of the district level for individualized information for local planning and evaluation? How would local managers be trained to use MIS for local decision-making?

Cost Analysis

One of the anomalies of MIS in PHC is that they rarely measure costs, even though budgeting and resource allocation are among the principle functions of PHC managers. Private sector programmes usually keep track of costs, but government programmes rarely do, often equating budgets with expenditures. This makes planning difficult. Oddly enough, the finance divisions of health units may be among the first to obtain computers, and to use them for payroll, billings, and other accounting purposes. But this information is rarely correlated with programme purposes.

Microcomputers and simple-to-use "spreadsheet" software makes budgeting, expenditure monitoring and even projections a relatively simple task. What can be done to introduce cost accounting into PHC programmes?

Can microcomputers be used to provide managers with timely cost information? How can PHC staff be trained to use the computer software that is now available?

Microcomputers in MIS

Computers are beginning to be seen in PHC programmes, but largely for word processing, some record management, and occasionally, financial management. They are not yet used to provide managers with information they need and can use to make decisions. They are not being exploited to increase efficiency and reduce paper work. In some cases they actually decrease efficiency and increase paperwork because they duplicate manual systems.

A serious obstacle to the productive use of microcomputers is human. The hardware and software technology exists in abundance. That is not the problem anymore. The problem is that it is not used. Why is that and what can be done about it? Is it a lack of awareness of managers of what can be done with microcomputers? Is it a lack of trained staff who know how to take advantage of this technology? Is it a lack of "user-friendly" programmes that are designed for PHC management needs?

Computers also open the door to different ways to collect and analyse data. PHC information systems are largely manual, relying on health worker registers of activities and "patient" records. Every event is counted. Every malady recorded and tabulated. This is clearly a labour-intensive way to collect and process information. And, as noted previously, once tabulated, there is often no analysis or interpretation of data. The counts of events, maladies, treatments, and services are summed up and reported.

Records and registers will always be needed, for patient management, if nothing else. But could some of that effort be put to better use with current microcomputer technology so that useful information could be provided to managers promptly and the workload of health staff reduced?

A number of alternative data collection and analysis approaches are suggested: *quick counts, rapid surveys, sentinal systems, annual household registration, focus groups, observations, problem checklists*, to name a few. What are the most promising uses of microcomputers in MIS?

What balance should be struck between continual recording of events on records and periodic collection of other information through alternative approaches? Most important, what information is needed on a continual basis, and what can be collected periodically, or only as needed?

Decision-Making Models

Management information systems are supposed to aid management decision-making, but most do not. One reason, already mentioned, is that most MIS are designed without regard for analysis and use of the data. Another reason is that the indicators that are used are often counts of events, not population-based statistics, not actual events compared with planned events. Most MIS produce descriptive information only. Managers are often left on their own to interpret the information, to see if it has any meaning, and to figure out what to do about it if it is significant.

Microcomputers and new software could change all this. **PHC programme managers could soon have access to the same decision-making tools that have been used in business and industry for years.** There are many to choose from, but few that are PHC-specific.

Several generic microcomputer software models have important implications for PHC management, including simulations, optimization, sensitivity analysis, forecasting, projection, "what-if" models, linear programming, project management, scheduling, and resource allocation.

Hardware is also underutilized, particularly modems for communications, printers and plotters. A number of software packages are rarely used, especially graphics, desktop publishing, and utility and add on packages to enhance standard programmes. Which of these tools can be most appropriately applied to PHC? What would be required to apply them in PHC programmes? How can managers be sensitized to the utility of these programmes; how can PHC programmes find the trained staff required to run them; and how can the required data be obtained?

CONCLUSION

These are only some of the opportunities and challenges that we face in attempting, once again, to find ways to provide managers with information that is reliable, valid, timely, and useful. **The difference this time is that we have some new, powerful tools: microcomputers and management-oriented computer programmes.** In fact, we have access to more of these tools than we can ever apply, and more are emerging every day. Our challenge is to identify those that have the most potential for Primary Health Care Management Information Systems, and to identify ways that they can be productively applied to assist communities, district and national managers in planning and monitoring PHC programmes.

FORGING FRESH APPROACHES AND NEW TOOLS

In Kinshasa, Zaire, a trained health worker enters field data on a solar-powered lap top microcomputer at the School of Public Health. (Photo by William Bertrand, Tulane University and University of Kinshasa Schools of Public Health)

Community-Based PHC Management Information Systems Guidelines for Development of a Model System

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INTRODUCTION

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IMPLEMENTATION

INTRODUCTION

This paper presents guidelines for development and operation of a management information system (MIS) for use by a community in setting its own priorities for primary health care (PHC) services and in monitoring changes that result from implementation of those services.

These guidelines draw heavily on experiences in Thailand with a multi-sectoral "Quality of Life" programme that helps communities evaluate their own development and plan their own projects. Experiences from other projects, especially the Kisumu Primary Health Care Project in Kenya, were also helpful in formulating the guidelines.

A community-based MIS would complement management information of a district health system; although, in some cases, the community and the health system would use the same data. The major distinction is in defining the user of the MIS. In a community MIS, the user is the community itself.

In most cases, the community would collect its own data and analyse that information to decide which health problems the community would attack. The community might be able to address some of these problems with its own resources (e.g., construction of latrines or development of a drug fund). Others would require assistance from the health system (e.g., immunization of infants and pregnant women).

In a district health MIS, the users are managers of PHC services. They need information to plan and monitor PHC needs and the services that they provide at the community and district levels.

Clearly, some of the needs will be recognized by the community also, in which case the community and the system can be expected to work toward common objectives. In other cases, the health system will identify needs that the community may not recognize or consider important, and vice versa. In those cases, some sort of negotiation between the community and the health system can be expected, as the health system tries to educate the community and elicit its cooperation in mounting a campaign against the problem. Typical examples include nutrition and growth monitoring, management of diarrhoea, and prenatal care. Likewise, the community may try to convince the health system that it needs assistance in areas that are outside the normal bounds of the PHC system, such as the provision of a resident physician or an ambulance. Although the health system may not

be willing or able to respond to some of these requests, that does not preclude the community pursuing them through other channels.

Thus, community-generated data and data sets of the district health system MIS should not be viewed as competing, but as complementary. Ideally, they should enhance cooperation where common objectives are identified, stimulate debate about PHC priorities, and increase community participation in PHC planning and monitoring.

Rationale for a Community Management Information System

PHC is based on a central principle of community participation, including participation in the planning and monitoring of PHC services. To carry out those functions, communities need information that they can use for planning and monitoring. A community MIS can meet that need. Without such information, communities have to depend on the health system to identify their needs, set their priorities, and monitor progress. Although the health system may be able to do this for a few communities, most cannot cover a fraction of the communities in their cachement areas.

Further, in this time of decreasing resources for PHC, it is unlikely that the health system will be able to expand its planning and monitoring efforts; they are likely to decrease. Thus, it is also in the interests of the health system that communities take a larger role in planning and monitoring their own PHC services.

Examples

Some skeptics may believe that communities cannot possibly manage and interpret PHC information adequately. It is true that very few communities include members who have had training or experience in this area, but most communities have merchants who manage financial and inventory information on a regular basis. Many have school teachers and others who have some experience in collecting, recording and interpreting information. And most have community health workers who are familiar with PHC activities and who have had some training in case-finding, interviewing, recording and interpreting data.

There are examples of community collection and use of health information that indicate that it is indeed possible for communities to operate a PHC management information system, as long as it is relevant to the communities needs and simple. One of the most impressive of these examples is the "Quality of Life" or Basic Minimum Needs (BMN) programme in Thailand. This multisectoral programme is now underway in over 20 percent of Thailand's rural communities. It involves an annual survey of each household on 32 criteria, including approximately 16 that are health status criteria. The results are compiled in the community and used both to set development priorities and to monitor improvement in the "quality of life".

A similar system is in operation in the Kisumu Primary Health Care Project in Kenya, where an annual household health survey is undertaken, and the results utilized by the community to set PHC priorities.

A number of community financing projects around the world require community collection and management of information on expenditures, income and activities. For example, a project in the Philippines set up small shops (boticas de barangay) that sell drugs and dry goods to raise funds to support PHC activities. The shops are run by community members who keep the accounts, order supplies, and report on their activities to their communities. Similar examples of community members managing financial information can be found in such diverse places as Nepal, Bolivia, Senegal and Haiti.

Whether it is feasible for a community to establish and operate a MIS is likely to depend on the characteristics of the community and its organization. For example, it may be more difficult for urban communities to manage an MIS. This is not because the people lack the skills, but because there is often less sense of "community", in and out migration is more common and, therefore, there is often less commitment to and interest in community affairs.

Two conclusions that emerge from an analysis of these examples are: 1) communities can manage and utilize information; and 2) they are likely to be willing and able to do this if it is in their self-interest and gives them control over PHC priorities and resources.

Basic Minimum Needs for Quality of Life -- The Thailand Experience

This social development project originated in 1981 in Thailand as a joint endeavour of the Ministries of Health, Education, Agriculture and Interior under the overall coordination of the National Economic and Social Development Board. This integrated approach to development has been termed the BASIC MINIMUM NEEDS method, in which the four ministries combined their objectives to form a list of basic minimum needs to serve as the standards against which rural communities can evaluate their own development and plan their own projects, with the support of the Government.

Training sessions are held for village communities, where the emphasis is placed on how to identify priority problems and how to mobilize the villagers to help themselves solve those problems. A simple methodology for data collection was designed which consists of three different parts.

Part I is "BMN 1", which is used to collect information on 32 indicators from each household. Part II is "BMN 2", which is used to collect general village level data. Part III is "BMN 3", which is used to summarize information collected through BMN 1 and BMN 2. The actual process followed in using these forms is as follows:

- A village committee interviews households using BMN 1 and then submits forms to the sub-district working group (Tambon level).
- The Tambon Development Activities Working Group collects relevant village information from the school, health centre, district office, etc., using BMN 2.
- The Tambon Development Activities Working Group combines information from BMN 1 and BMN 2 in one form: BMN 3. BMN 3 thus describes village basic minimum needs as well as sub-district (Tambon) basic minimum needs.

Using the BMN 3 form, the Village Committee and Tambon Development Activities Working Group identify problems, including those BMN items that are below village BMN standards. Following this, the Village Committee prepares a development plan to solve the priority problems that were identified and submits this proposal to the village and to the Tambon sub-district council. Based on a thorough review of these proposals, the Tambon Council selects priority problems and decides on proposals to submit to the district level for budget allocation and technical support.

The BMN survey is made every year. Once the village plan is agreed upon, the Village Committee takes responsibility for working closely with the villages so that they will be fully aware of what has to be done, who has to do it, how and with what resources. Responsibilities for implementation and monitoring are then established.

Community-Based Assessment of Primary Health Care
The Experience of the Aga Khan Health Service of Kenya

The Aga Khan Health Service of Kenya has developed a community-based PHC program near Kisumu, a town in eastern Kenya, for a rural population of about 60,000 people. This program, which has functioned for about six years, could be seen as a prototype for extensive community participation in planning, implementing and evaluating health services. Here, too, is an example of a community management information system. The geographical area is divided into three parts of about 20,000 people each. Every year, project personnel enter into dialogue with the communities and plan a village by village assessment. The community people actually carry out the assessment, analyse the data, discuss the findings and, on that basis, make decisions about their PHC programs. Following are the steps involved:

(1) Planning

- In community workshops, community leaders and village representatives brainstorm their health problems and then rank them in order of importance. They discuss causes and possible ways to alleviate the problems in the context of their own situation and the resources available to them.
- Each workshop ends with a plan of action which includes: activities to be undertaken; by whom and with what resources; by what date; and how the community will assess its own progress towards solving its problems.
- The action plan prepared by the community then becomes the basis for community self-assessment.

(2) Annual Assessment

- The community, through its leadership at the sub-locational level requests assistance with its self-assessment.
- A meeting is planned by the community and attended by the Community Nurse and project information personnel. During the meeting they: review their action plans; agree on what to measure and how to measure it (indicators); develop a data gathering instrument; plan the assessment in terms of logistics and personnel for data collection, the schedule, the analysis, discussion and feedback to the rest of the community, and a ceremony to recognize the best village(s) and (sometimes) the best households. Usually, each village selects a member to join the assessment team. Teams are formed for the assessment in such a way that individual assessors do not assess their own villages.
- Data collection forms are typed and produced in the office.
- The assessment team is trained on how to gather data, and logistics are planned.
- Field work is carried out. Usually all the households in each village are visited.
- The assessors, project staff, committee members and other village leaders meet to analyse and interpret the data.
- A meeting of the whole community is called to provide feedback and recognition of outstanding performance.
- Each village meets to re-plan its strategies, activities, etc., in the light of their performance, health problems and resources.
- The Community Health Nurses who live within the community (and who are trained health workers and members of the health team at the most peripheral level) continue to followup community activities based on the action plans. This exercise is usually done once a year and the best village gets a trophy and a certificate of excellence.

(3) Monthly Reviews

- Monthly meetings are organized at each sub-location (there are 14 in the project, with about 5,000 people each). At these meetings the community health workers ask the village and group level committees to report on their activities, achievements, and problems. The meetings are attended by project staff, various community leaders and other government and non-government extension personnel.

Principles

Two important principles can be drawn from this analysis. First, **although health system staff may assist communities in designing, implementing and utilizing a community MIS, the community must use the system to make its own decisions.** Otherwise, if the health system staff decide for the community what is needed, this is a *health system* MIS, not a community-based MIS.

Clearly, there is a fine line between helping community members to interpret data and telling them what the data say they need. But this principle is fundamental, and well-understood in all fields of adult education. People learn best by doing, not by having someone else do for them.

AKU PRINCIPLES OF MIS

PHC Provides Universal Coverage

- every household assigned to community health worker (CHW) ... periodic surveillance
- identify risk factors ... care according to need

Front Line Workers Given Supervision/Support

- CHW supervised by lady health visitor (LHV)/community health nurse (CHN)
- data aggregated by CHN ... feed back to CHW/LHV

Senior Personnel Provide Managerial Oversight

- data analysed by community health doctor (CHD) ... feed back ... feed forward
- data/decisions shared with community

Microcomputer Used for PHC System Back-Up

- selective data base, analysis
- comparisons, projections, cost-effectiveness
- peripheral decision loops not computer dependent

Second, communities must see a benefit to themselves in operating a MIS. That benefit may be an economic, health, or power benefit. If the system helps the community in one or more of these ways, there will be a strong motivation to use the system.

Assumptions

The guidelines presented here are based on several important assumptions that are drawn from the experience of the workshop participants:

(1) **The community is both willing and able to implement a simple MIS.** For example, there must be enough literate and educated people to record and tabulate data; there must be enough people willing to devote the time required to collect and process the data.

(2) **The system will be simple, inexpensive, and require very limited data collection and analysis.** Most communities will have neither the time nor the interest to collect large amounts of data on every PHC activity, nor will they be interested in drawing probability samples, conducting reliability checks or running statistical tests. To be acceptable, the system must be very simple.

(3) **The system will be manual, not computerized.** Very few communities either need or will be able to afford a computer to process MIS data. The computer is not "appropriate technology" for a community-level MIS. That does not preclude entering and processing the same data on a computer at a district or provincial level.

(4) **Technical assistance will be available from a nearby health post or district health office.** Very few communities will have the ability to design and operate a MIS without assistance. They will not often require sophisticated assistance, however, and sub-district and district health staff should not have any difficulty meeting the assistance needs.

(5) **The users will be community members and local health officials, not either one alone.** Although the primary users will be communities, local health officers can be expected to find the community data useful as well. And the interaction of community and health system staff around MIS data can promote mutual understanding and cooperation.

(6) **The system will be a "living" and flexible system**, i.e., it will change over time and it will vary from community to community to reflect different information needs. This is a crucial assumption. While the health system may prefer standardized indicators so that comparisons can be made and trends examined, most communities will be interested in local problems, which will vary across communities and over time.

(7) **The system will not replace the Ministry of Health or non-governmental organization information system**, but may complement or substitute for part of that system. Most communities can be expected to be interested in measuring many of the same PHC needs and activities as the health system. In some cases, at least, community-gathered data may be sufficient for health system needs.

(8) **The system will be adequate for local purposes, but not for scientific purposes.** Communities cannot be expected to be as careful in collecting and tabulating data as trained researchers. Thus, health system planners and evaluators may have to mount special studies to gather data that is needed for scientific purposes.

Advantages and Limitations

A community MIS has several distinct advantages, but it also has a number of significant limitations. Among the advantages, probably the most important are that it encourages community participation in PHC and it lessens the burden on the health system to do everything for the community.

Among the limitations are the questionable quality of data collected and analysed by untrained community members; the possibility that increased community involvement and awareness will lead to increased demands on the health system for services; the potential for conflict between community and health system priorities; and the increased burden on the community of operating a MIS.

Another important issue that needs to be kept in mind is the unique character of each community and the difficulty this may pose for implementing a MIS in all communities. For example, some communities are heterogeneous and stratified to such a degree that no sense of community exists. Some communities have no health workers and no health or community leadership. Urban communities often pose a more difficult problem than rural communities for a number of reasons, including diversity of members, mobility and transience, availability of alternative health service providers, pockets of significant poverty and dependency, different disease patterns, and so forth. Finally, countries are at different levels of development and some governments may not be as ready as others to permit community self-determination.

GUIDELINES FOR A MODEL SYSTEM

Objectives

The MIS will have two complementary objectives: 1) **to enable the community to determine its own PHC needs and select its own PHC programme priorities**; and 2) **to enable the community to monitor PHC programme performance in meeting community needs**.

The "needs" identified and monitored might include PHC programme inputs and activities, as well as the resolution of health problems. For example, a community may determine that it needs to reduce malnutrition (a health problem). It may also conclude that it needs a community health worker (a health resource, or input) and quarterly weighing of infants (a PHC activity).

Users

The principal users of the community MIS would be community members and leaders. In some case, individuals or households can be expected to use the information to decide what they will do to improve their individual health status (construct a rain water cistern, for example). In most cases, a group of community leaders (a village development committee, a health committee) would use the data to identify needs and set priorities.

In Thailand, the BMN programme users are typically Village Development Committees, which oversee the collection of data by Village Volunteers, analyse the data to identify priority needs, present the analysis to the community, facilitate the community specification of priorities, and present the community's request for assistance to the sub-district and district government.

Information Needs

Information needed to identify PHC needs and to monitor PHC programme services will vary depending on the health profile of each community, the community's PHC priorities, and the PHC services that can be provided by the government programme.

The major need will probably be for information on individual and community health and PHC service status, i.e., what are the principal health problems (e.g., diarrhoea, malnutrition) and PHC service needs (e.g., oral rehydration solution, food supplements and health education). This information will be needed for two purposes: 1) to identify what needs to be done; and 2) to determine if what was done has had any impact.

The secondary need will probably be for information on PHC services. Have the needed services been provided by the government (e.g., immunizations); and have the community members done what they needed to do (e.g., built latrines)?

Also, it is not likely that communities will have large enough populations to measure key health status indicators accurately (e.g., infant mortality). They are not likely to be interested in detailed measurements of inputs (CHW time spent on PHC, for example), unless they are managing the finances of a PHC component, such as a drug fund. Similarly, they are unlikely to measure support system activities (training, supervision, planning, logistics) or PHC service processes (immunization promotion, oral rehydration therapy education, weighing session procedures).

Thus, the number and type of information that communities are likely to be willing and able to measure can be expected to be very limited. The Thai BMN programme consists of 32 indicators, but only about 16 deal with health. The Kenya project, which deals only with health, is limited to around 10 indicators.

Indicators

No standard set of indicators can be prescribed for each community, since health needs and PHC programme activities will vary. Therefore, each community can, and should, select its own indicators. This has been the experience in both Thailand and Kenya, and it seems to work well. In both cases a standard set of indicators is presented to the communities, and the communities choose the ones that are important to them.

Nevertheless, to permit aggregation and comparison, it would be best if communities would select their indicators from a standard list. For example, if a community is interested in immunizations, the health staff could recommend one of the standard indicators, such as the percent of children under two years of age who have completed the full series of DPT, BCG, polio and measles immunizations. WHO and AKF have developed such sets of standardized indicators, and other groups, including PRICOR, are developing indicators for each PHC intervention. (*See* Appendix B)

The workshop participants drew on their own experience with community involvement in MIS to prepare an illustrative list of priority indicators for a community MIS. They also identified some important, **practical guidelines for selecting (or recommending) indicators**:

(1) Communities do not usually understand rates, ratios and percentages. They understand counts, and all indicators should be simple counts (e.g., the number of infant deaths, the number of houses with potable water). A practical alternative to rates is to collect information on the number of households needing an intervention. For example, instead of counting the number of households with privies, count the number of households without them, which will indicate what needs to be done.

(2) Communities do not usually understand sampling, and will want all households included in the MIS because they do not want to exclude anyone. This has an advantage for health system staff who may want to analyse community data for other purposes. It will provide a denominator for each community. Furthermore, if simple demographic information is collected (number of household members by age and sex, for example), then a variety of epidemiological tools can be employed to compute rates, ratios, and make projections.

(3) Each community will have different concerns, so it will be best to present short lists of suggested indicators from which they can choose those that are most relevant to them. Since the major concern is PHC, especially for "Child Survival", the emphasis of many programmes and communities will be on protecting and promoting the health of mothers and children. Indicators of each PHC "Child Survival" inter-

Kenya -- Indicators for Community Self-Assessment

Those always selected by all villages:

Maternal and Child Health (MCH) card presence for children under the age of five years (% households with MCH cards).
% children under five years who have completed immunization.
% households having and using a pit latrine.
% households having and using a dish-drying rack.

Usually, but not always, selected by all villages:

% children in good nutrition status by weight for age.
% mothers using Oral Rehydration Therapy (ORT) correctly for management of diarrhoea.

Sample Data Collection Instrument

LOCATION:															
SUBLOCATION:															
VILLAGE:															
House-holds		**MCH Card**		**Com-pleted Immu-nization**		**Latrine Pres/Use**		**Dishrack**		**Nutrition Status**		**ORT Use**		**Total (House-hold)**
No.	Head	+	-	+	-	+	-	+	-	+	-	+	-		

vention should be presented to the community for consideration. These include indicators of the following:

- *child care* -- immunizations, diarrhoea/ORT, growth monitoring, breast-feeding, nutrition, respiratory infections
- *maternal care* -- prenatal care, safe delivery, tetanus toxoid, postpartum care, family planning
- *water and sanitation* -- potable drinking water, latrines, cleanliness

(4) Community members cannot be expected to appreciate the distinctions health professionals make among diseases, maladies and treatments. They are more likely to deal with general symptoms; thus, the categories of indicators should match those classifications. For example, indicators can be grouped in three or four broad categories as above (child care, maternal care, water and sanitation) to keep things simple.

(5) Each community can be expected to have: a) locally endemic diseases that are a priority concern (e.g., malaria, dengue, parasites and intestinal worms, snakebite, accidents); and b) non-health concerns that indirectly affect health (e.g., lack of firewood, which makes boiling water impossible). It is logical and appropriate to include indicators of these local concerns in the community MIS.

(6) Communities can be expected to be at different levels of development and sophistication where indicators are concerned. Those which have basic problems and little experience with health programmes may be concerned about "*access*", and their indicators will reflect a preoccupation with access to safe water, access to health services, access to trained CHWs, etc. Other communities, which may already have access, may be concerned with health service *utilization*, e.g., children immunized, mothers visited by trained midwives, etc. Still other communities may have achieved adequate levels of health service utilization and may be concerned about the *impact* or effectiveness of these services. These communities may choose indicators of the incidence or prevalence of diarrhoea, malnutrition, and low birthweight. Finally, some communities may select a mixture of types of indicators. Whatever the concerns of the community, the indicators should reflect them. It is less important that communities select "appropriate" indicators than that they become involved in planning and monitoring primary health care.

(7) Participation in PHC is often an important issue and it may be useful to include an indicator of community participation in the set. Examples are "number of mothers belonging to a group or club that deals with community health issues".

(8) Births and deaths are critical events in most communities, and it is often possible to collect these data. Some communities monitor their health status informally by keeping general track of infant deaths ("this year 50 children died, last year it was 30...what's wrong?"). Thus, in many cases it may be possible and useful to the community to include overall indicators of health (infant, child, maternal mortality, births).

(9) The workshop participants suggested that health workers provide communities with a short list of selected PHC indicators, as shown below, but have a more extensive list available in case the community wants to include other indicators.

EXAMPLES OF PRIORITY PHC INDICATORS:

These indicators are arranged in three broad categories: 1) mortality and fertility; 2) morbidity; and 3) preventive PHC activities.

Mortality/Fertility

- number of infant deaths (age under 1 year)
- number of child deaths (age 1 through 4 years)
- number of maternal deaths
- number of live births

Morbidity

- number of cases of immunizable diseases (polio, pertussis, etc.)
- number of cases of diarrhoea in children under 5 years
- number of cases of 2nd and 3rd degree malnutrition among children under 5 years
- number of complicated pregnancies and deliveries
- number of low birthweight babies
- number of pregnancies with intervals of less than 2 years

PHC Preventive Measures

EPI

- number children under 2 years who have completed DPT, BCG, polio and measles immunizations
- number pregnant women immunized against tetanus

ORT

- number mothers with children under 5 who regularly use ORT for diarrhoea

Growth Monitoring/Nutrition

- number mothers with children under 3 who have up-to-date growth charts
- number mothers breast-feeding infants for one year or more
- number mothers giving infants supplemental foods by age six months

Prenatal Care/MCH

- number pregnant women receiving prenatal care
- number pregnant women delivered by trained TBA/midwife/provider
- number mothers who receive postnatal care

Water and Sanitation

- number households with year-round potable water
- number households with clean privies

Family Planning

- number married women of reproductive age using family planning (contraceptive practice rate)

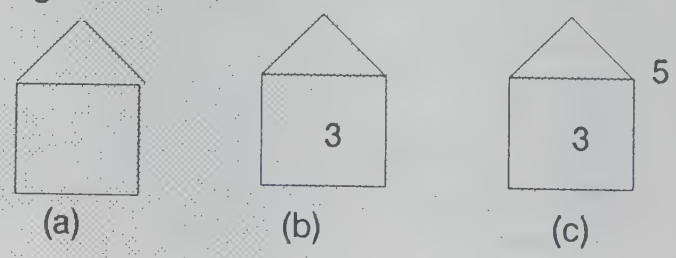
Data Collection

Since data collection will have to be done by community members, it must be limited, both in quantity and in frequency. Given the first priority to collect data on health and PHC service needs, this information would be collected annually from all households, either on community registers or individual household records. The data could be collected by household members and/or community health workers, with technical assistance from health officials. Some standardized records have been developed and may already be in use in some communities. These include growth charts for children, mothers' cards, and community maps that identify relevant health information (e.g., households with children under two, users of family planning).

A Community Health Worker MIS in Vur, Pakistan

The Vur community health demonstration project is one component of the Health Manpower Reorientation Project of the Aga Khan Health Service (AKHS) in Pakistan. This PHC demonstration project covers a rural population of 13,000 within a 7 kilometer radius of Vur village in Sind province. The project was designed to train health care professionals in the AKHS network who will work in other PHC projects.

Interaction between project staff and various communities led to the CHWs initiating two information tools that are used for planning and monitoring their work. Although the project staff also use this information at times, it is collected and used by the CHWs and village community leaders to make decisions about the programme.



The CHWs made their own spot maps of their respective area showing each house (a), giving it a said number (b) and showing how many family members live in that structure (c); then they made a list of all houses with children under the age of five. This helps them in their work of visiting each household, identifying households with problems, and following up as necessary.

During the training of CHWs, the project staff asked the CHWs to identify and list the health problems each one found in their own village. This subsequently led to the CHWs' development of registers in which they list such things as deaths by cause, births and birth weights, and illnesses. The CHWs then report significant occurrences to the village meetings and this is used as a basis for decision-making and promoting action.

Second priority data, on PHC services and activities, would be collected at monthly or quarterly intervals by community health workers, using forms designed with assistance from health officials.

Special studies of PHC needs and/or service problems would be collected through special studies, e.g., rapid surveys. In most cases, these would not be collected by the community, although their assistance could be solicited.

Data Analysis

Data on individual household health status and PHC needs can be compiled at the household level. The household records would then need to be aggregated at the community level to identify community PHC needs. As noted above, this will probably require technical assistance from local health officials. The community analysis should be made in terms of rates and priority needs; that is, the community should be able to identify its primary health problems and PHC needs.

Reporting and Utilization

The primary users of the data would be community leaders and individual household members. Secondary users would be PHC officials, who would be expected to use the information to supplement or complement data collected from their own MIS.

Resource Requirements

Personnel Requirements

It is unlikely that a community will be able or willing to provide all of the personnel required to design and implement an MIS. It is also unlikely that one person will be able to manage the entire system. It is more likely that different people will be (or will have to be) involved in different functions. For example, household members, community health workers and/or village health committee members may be involved in data collection. A teacher or shop owner may be involved in data tabulation and analysis. Village leaders may be the primary users of the data. Each community will probably need some technical assistance, especially in design and analysis, since these are fairly sophisticated areas. Communities can be expected to do fairly well in data collection, but even in this area they will need training and technical assistance. Communities with literate, experienced and educated members will be able to do more than those without this type of population.

DESIGN AND ANALYSIS. Communities will usually need technical assistance from sub-district or district health staff to design the MIS, and assistance and/or training in tabulation and analysis of data.

DATA COLLECTION. Households, community health workers and community health committees can collect most data except those requiring sophisticated measuring instruments (e.g., anthropomorphic measurements, blood slides) or procedures (e.g., growth monitoring).

INTERPRETATION AND UTILIZATION. Simple interpretation and decision-making can be done by households and community leaders. Some technical assistance and/or training may be required.

In addition to the personnel requirements noted above, few resources would be required, primarily paper, pencils/pens, and transportation.

IMPLEMENTATION

This workshop was convened to address some of the most pressing problems of health and health care in the Third World. Accordingly, the recommendations are intended for a broad international audience.

First, the participants in this Technical Working Group on Community PHC Management Information Systems includes members from most of the Aga Khan PHC programmes in Africa and South Asia, and they each **accept the challenge of attempting to implement community-based PHC management information systems** in their respective settings.

Second, it is suggested that the Aga Khan network consider incorporating into its policies and programmes the **encouragement and support of community-based PHC management information systems**.

Third, these **ideas are worthy of consideration widely by the international community -- governments, international organizations, non-governmental organizations, and individuals**.

Aga Khan Community Health Programme
Dhaka, Bangladesh

In Bangladesh, the Aga Khan Community Health Programme (AKCHP) is trying to establish a community-based PHC programme for a 67,000 population of Dhaka city. The project serves communities of considerable socio-economic diversity. Linkages have been established with several local community organizations to promote community level management of their own health care initiatives. The project has trained 22 Community Health Workers. Each CHW is responsible for 600 households, each of which they visit at least once during a three month period. The CHWs are actively involved in collecting data, identifying and monitoring malnourished children, imparting health education to mothers, and identifying and immunizing children and women of child-bearing age who are not completely immunized. The CHWs have also organized several mothers groups and identified one volunteer from each of these groups who is being given (or will be given) training in basic health issues and simple data collection methods.

AKCHP intends to pursue the idea of developing community-based MIS by involving the community organizations (such as the Ansar and Towns Defence Party Club in one area and the Railway Diploma Engineer's Association in another) in data management and volunteer mothers in collection of the data that the community feels is important. The CHWs (the CHWs are paid workers) will then only collect any additional data needed by the health system. Although in some of the slum areas where the in and out migration is more common and, thus, the sense of "community" is almost nonexistent, the project will probably not be successful in developing community-based MIS.

A community health worker of the Aga Khan Community Health Programme in Dhaka, Bangladesh, measures the mid-upper arm circumference of a young child to assess his nutritional status. (Photo by Jean-Luc Ray, AKF)

A special study in Gilgit and Chitral, northern Pakistan, revealed continuing high rates of iodine deficiency disorders ("goitre"). Here the provincial Minister of Health demonstrates that oral administration of iodized oil is a simple and safe procedure which can be conducted by local health workers. (Photo by Jean Luc-Ray, AKF)

The Community MIS in The Northern Pakistan Primary Health Care Programme at Gilgit and Chitral

The Northern Areas Primary Health Care Programme is just now beginning, but over the next three years it is expected to cover a population of approximately 100,000 in three different areas with the objective of establishing a community-based programme that will concentrate on MCH services. Aga Khan Health Services (AKHS) first established MCH centres in this area almost 20 years ago and now has 25 such centres. This new initiative is designed to involve the community to a much greater extent in managing its own programme and to integrate with programmes in other development sectors. The potential for developing community-based MIS in these settings is substantial.

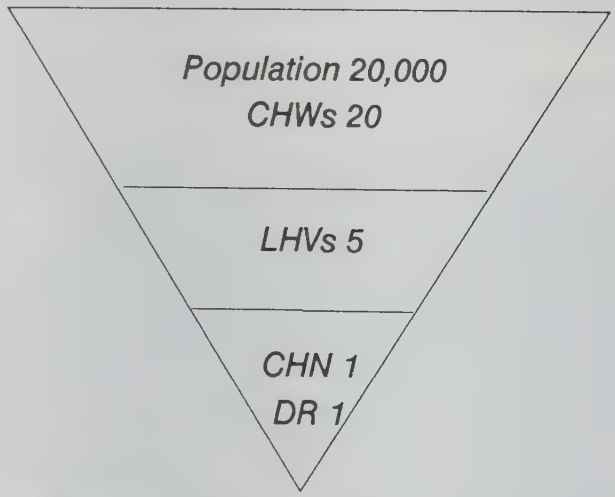
There is also strong potential for interactional programs. In addition to AKHS, the Aga Khan Education Service (AKES), the Aga Khan Housing Board (AKHB), and the Aga Khan Rural Support Programme (AKRSP) are also working in this area to help promote education for all children, improve general living conditions and provide a better infrastructure such as water channels for irrigation. AKRSP in particular has promoted the development of village organizations (VOs) to manage and carry out projects and AKHS, AKES, and AKHB are beginning to work with these VOs to provide a broad spectrum of opportunities for development at the village level. AKRSP has used written contracts between the VO and themselves to define respective roles and responsibilities and AKHS plans to use this same approach to develop the PHC programme. Since most of the villages of these areas have developed VOs, the possibilities of community-managed PHC programmes including components of PHC MIS are quite likely.

Community involvement is planned at each level with the VO managing the programme at the village level, a representative of each VO on a committee to help manage the MCH centre, and a representative of each MCH Committee on a Zonal Health Committee and a member of each Zonal Health Committee on the Regional Health Board which already exists to develop overall policies for the development of health services in the North. An integral part of each VO' s program is its own collection, analysis and utilization of management information. It is expected that it will take several years to fully develop this system.

A Health System in Support of Community MIS
The Aga Khan University Urban PHC Network in Pakistan

The Aga Khan University has established community-based PHC programs in five katchi abadis (squatter settlements) of Karachi. The communities served by these programs are highly varied in ethnic, socioeconomic, ecological and political characteristics. They are also varied in their capacity for and interest in managing their involvement in health services. Thus, they represent a spectrum of opportunities for exploring ways in which an established health system might promote and support the development of community management information systems.

The Aga Khan University's Urban Primary Health Care Programme



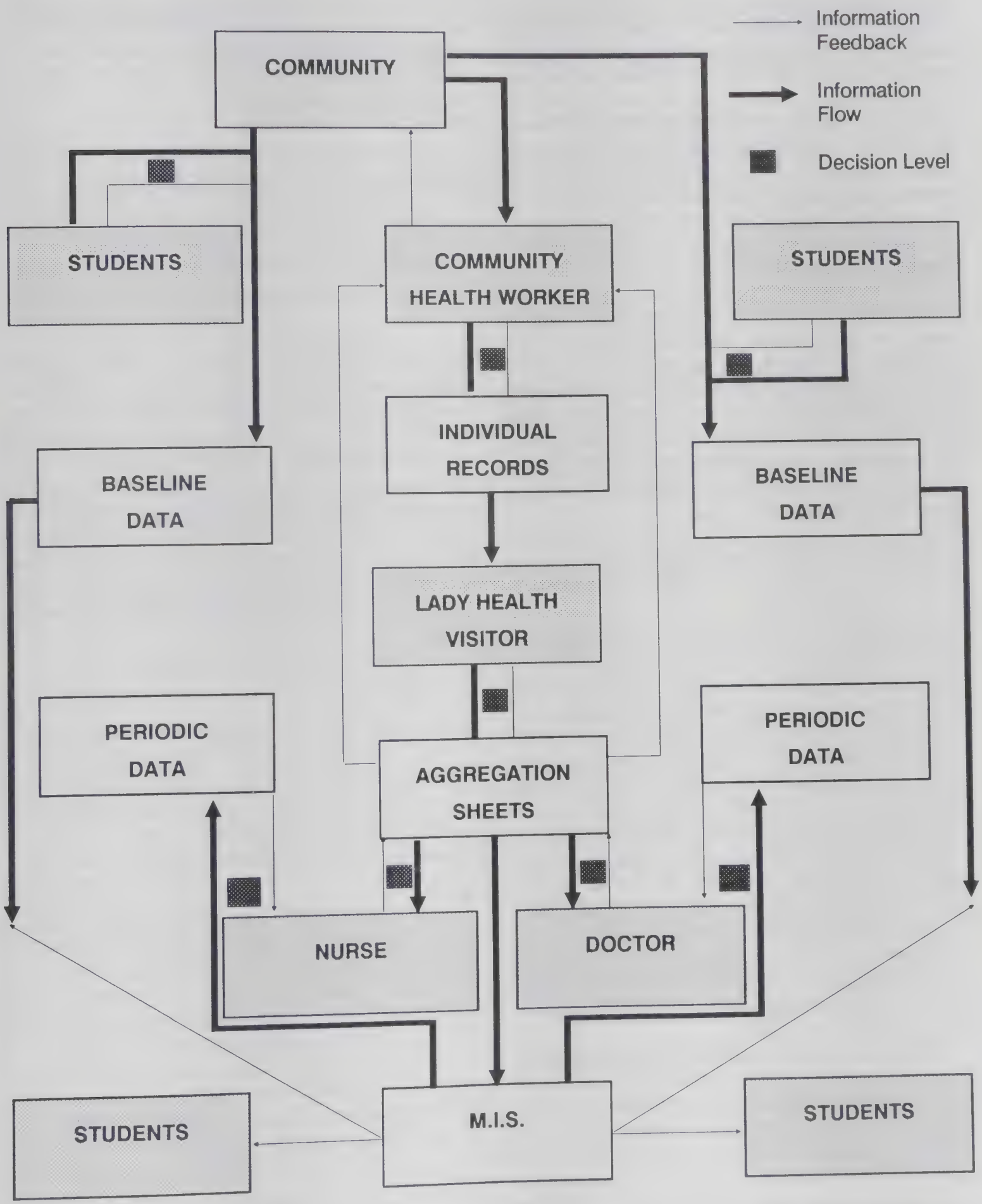
The AKU PHC network is based on the principle of universal coverage of defined populations. The population of each field site is characterized by a baseline survey. Subsequently, community health workers (CHWs) maintain health surveillance of all families, identifying persons at risk and initiating or arranging for appropriate health care. Relevant data are recorded in family folders and periodically aggregated by supervisory personnel for management purposes. Data are subsequently sent to the hub of the network for computerization, analysis and feedback. The peripheral components of the MIS are not computer dependent, and most decisions at the community and health center level are made on the basis of information that is handled manually.

Examples of health problems under home-based surveillance are immunizations and nutritional status. CHWs identify children who are not completely immunized and urge the mothers to bring them to the health centres for immunizations. CHWs also monitor growth of children under five and follow those at grade two and three malnutrition with frequent home visits, instructing and encouraging mothers to achieve more effective nutritional support of their children. Communities in the different field sites are, or could be, involved in data management in the following ways:

- A group of young men belonging to a local civic organization volunteered to carry out growth monitoring on a monthly basis.
- The leadership of a local church invited the health team to use the church for growth monitoring. The church group organized the mothers, registered them for growth monitoring, assisted in the weighing and explanations of the results to the mothers. They also combined the weighing with baptisms, which gave increased attention and social validity to the growth monitoring.
- The PHC team in Orangi meets with lane committees, women organized by the CHW for discussion of health issues; they could develop a simple information system to keep track of their decisions and follow-up actions.
- The Village Health Committee in Grax has asked the health team to consider a prepaid approach to PHC, and has indicated a willingness to cover the costs of the poorest members of the community. They would be willing to monitor the income and expenditures related to that financing system.
- The PHC health team of Issa Nagri has responded to community requests for a school health program, and the teachers in the schools are willing to develop the information system for recording the findings and monitoring the follow-up of children requiring further health services.
- Other communities not currently served by part of the PHC network have asked for assistance. Conceivably, the network could assist them in doing their own survey and in initiating their own limited health services.

Given the validity of the concept of community MIS, more extensive coverage of communities with PHC is possible, though at a simpler and less closely monitored level.

The Aga Khan University Primary Health Care Management Information System



Bi-directional and regularly periodic information flow is important to ensure management information is up-to-date and is available for use at the appropriate levels of management decision-making. (Source AKU/FHS)

Several of the workshop participants identified opportunities in their own programmes for implementing community MIS. For example, the Kisumu PHC Project plans to review its ongoing community-based information systems and develop them further, based on these guidelines. An information system for a new project in Mombasa will be developed following these guidelines. The project staff expect that each subproject will reflect individual needs and interests and suggests that after two or three years of testing that there should be a review of progress, problems, and lessons learned about community-based MIS.

In Thailand, a PRICOR-sponsored project is testing the effectiveness of a decentralized PHC programme. The test is being carried out in Srisaket, a province in the Northeast. One of the components that is about to be designed is the MIS. That design will incorporate the workshop recommendations and offers an opportunity to test both community and district-level MIS as well as use of microcomputers.

Participants from several Aga Khan network projects in Pakistan also identified opportunities for testing community-based MIS. In Bangladesh, for example, the Aga Khan Community Health Programme is trying to establish a community-based PHC programme for a 67,000 population of Dhaka city.

> The community-based MIS system is a genuine test of the principle of health for all in that it embodies not only participation, but actually decision-making by the community.

This approach does, however, require distinct shifts in perspective on the part of personnel in the health system. First, their role becomes almost entirely advisory as the community gathers, analyses (with help), and uses the information for planning and possibly monitoring. The health personnel will have to appreciate that the data will be of a different quality than if they had collected it. It is such shifts and perspectives that enables and supports the community itself in taking on a new role, that of deciding what it will do for itself in health.

MANAGEMENT INFORMATION SUPPORT FOR DISTRICT HEALTH SYSTEMS BASED ON PRIMARY HEALTH CARE

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THE CONTEXT OF INFORMATION SUPPORT TO OPERATIONAL MANAGEMENT FOR PRIMARY HEALTH CARE

DISTRICT HEALTH SYSTEMS BASED ON PRIMARY HEALTH CARE
DEFINITIONS * PRINCIPAL FEATURES

COMMON DEFICIENCIES IN CURRENT DISTRICT MANAGEMENT INFORMATION SYSTEMS
IMPORTANT INFORMATION IS MISSING * AVAILABLE DATA IS INAPPROPRIATE IN QUANTITY AND QUALITY * HEALTH STAFF HAVE LIMITED SKILLS IN INFORMATION PROCESSING AND USE * AVAILABLE INFORMATION IS NOT SUFFICIENTLY USED FOR LOCAL DECISION-MAKING

DISTRICT DECISION-MAKING AND USE OF INFORMATION
RESOURCE ALLOCATION AND UTILIZATION * USE OF SERVICES, COVERAGE AND QUALITY * POLICY AND STRATEGY * ASSESSMENT OF HEALTH NEEDS AND PROGRAMME EFFECTS AND IMPACT

GUIDELINES FOR IMPROVING DISTRICT MANAGEMENT INFORMATION SUPPORT
INCREASING THE SCOPE OF AVAILABLE INFORMATION * CLARIFYING DISTRICT NEEDS, RESOURCES, OBJECTIVES, TARGETS AND INDICATORS * STREAMLINING PROCEDURES FOR DATA MANAGEMENT * IMPROVING THE SKILLS OF DISTRICT STAFF IN MANAGEMENT AND USE OF INFORMATION * BROADENING THE USE OF INFORMATION, PARTICULARLY WITHIN DISTRICT AND COMMUNITIES

ROLE AND POTENTIAL OF MICROCOMPUTER SUPPORT FOR DISTRICT HEALTH SYSTEMS

IMPLICATIONS FOR POLICY AT NATIONAL AND INTERNATIONAL LEVELS

THE CONTEXT OF INFORMATION SUPPORT TO OPERATIONAL MANAGEMENT FOR PRIMARY HEALTH CARE

A major aim of the workshop was the improvement of information support for management of health care programmes to improve the efficiency and effectiveness of the health system. Attention was directed primarily towards the information systems needed for operational management of primary health care, rather than to information needs for strategic planning and monitoring at the national level, which has been well addressed in a variety of other publications.

As a part of the efforts of the World Health Organization (WHO) to strengthen the implementation of primary health care, based on the principles agreed on by most nations at Alma Ata in 1978, WHO has recently been placing increasing emphasis on the development and strengthening of "district health systems based on primary health care."[1] This workshop found the concept of the district health system exceedingly helpful in examining in a practical way the variety of information sources and information needs for strengthening operational management of the health system. For this reason, the basic features are presented in the following section as an aid to understanding the analysis of supporting information systems which appears later.

Three major sources of information were identified. The first and most common source is the traditional **health facility-based record system**, which includes information on a variety of types of individual contacts between health service institutions -- such as clinics, health centres and hospitals -- and information on a variety of technical and management support activities -- ranging from laboratory, radiological, emergency and surgical services to management of vehicles, equipment, supplies and personnel. Two key deficiencies of this type of information for **health**

system management are that (1) it is generally restricted to **medical care** services; and (2) it provides information about only those persons who actually use the health facilities, and tells nothing about the health status or health needs of people who are not using these facilities.

The second source is the **community-based information** system. The potential of such a system to provide information to local communities concerning the status of the entire population with regard to priority concerns is considerable in theory, but the actual developments in this area since Alma Ata have been very limited. This is true even where, as is frequently the case, the community-based activities are initiated and supported by a team from a nearby health services institution. As will be noted later, a key issue concerning community-based health infomation systems is the extent to which they should be asked to provide information to the formal health system which exceeds the information which is needed by the community itself to manage its own more limited activities.

The third major source is information from **special studies** and other sources such as census data which is not part of the routine record-based health management information system, but which may provide valuable supplementary information, particularly concerning the population which is not included in the record-based system.

This chapter of the report attempts to look in a holistic manner at the overall information requirements for a district health system. The reader is referred for more detailed treatment of community-based information requirements for community PHC management to Chapter 9. Although financial resource allocation decisions are mentioned briefly later in the current chapter, the use of financial information to improve the effectiveness and efficiency of district health systems is considered more thoroughly in Chapter 11. Finally, the complementary role of special studies and other alternative sources of data in support of health system management is given special attention in Chapter 12.

DISTRICT HEALTH SYSTEMS BASED ON PRIMARY HEALTH CARE

Definitions

The World Health Organization defines a district health system based on primary health care as "a more or less self-contained segment of the national health system. It comprises first and foremost a well-defined population, living within a clearly delineated administrative and geographical area, whether urban or rural. It includes all institutions and individuals providing health care in the district, whether governmental, social security, non-governmental, private or traditional."

> "A district health system therefore consists of a large variety of inter-related elements that contribute to health in homes, schools, work places, and communities, through the health and other related sectors. It includes self-care and all health care workers and facilities, up to and including the hospital at the first referral level, and the appropriate laboratory, and other diagnostic, and logistic support services. Its component elements need to be well-coordinated by an officer assigned to this function in order to draw together all these elements and institutions into a fully comprehensive range of promotive, preventive, curative and rehabilitative health activities."

The district diagram shown in Figure 1 indicates schematically how a district health system might look, linking communities with a variety of health facilities, irrespective of their form of ownership or source of financing.

Principal Features

The "ideal" district health system is, like health for all, a goal to guide our efforts for improving existing health systems. Districts, under one name or another, are not new, and health services have been available in districts and their constituent communities in most countries for a long time. The recent attention to district health systems has arisen from a growing awareness that better organization and management of health activities at the operational levels is critical for effective implementation of primary health care. This has led to an effort to understand more clearly how the basic principles of primary health care elaborated at Alma Ata in 1978 should be translated into changes in the organization and functioning of health services, and their linkages with communities and other sectors. A number of the key features of the primary health care approach which have particular importance in moving towards district health systems **based on primary health care** are found in Table 1.

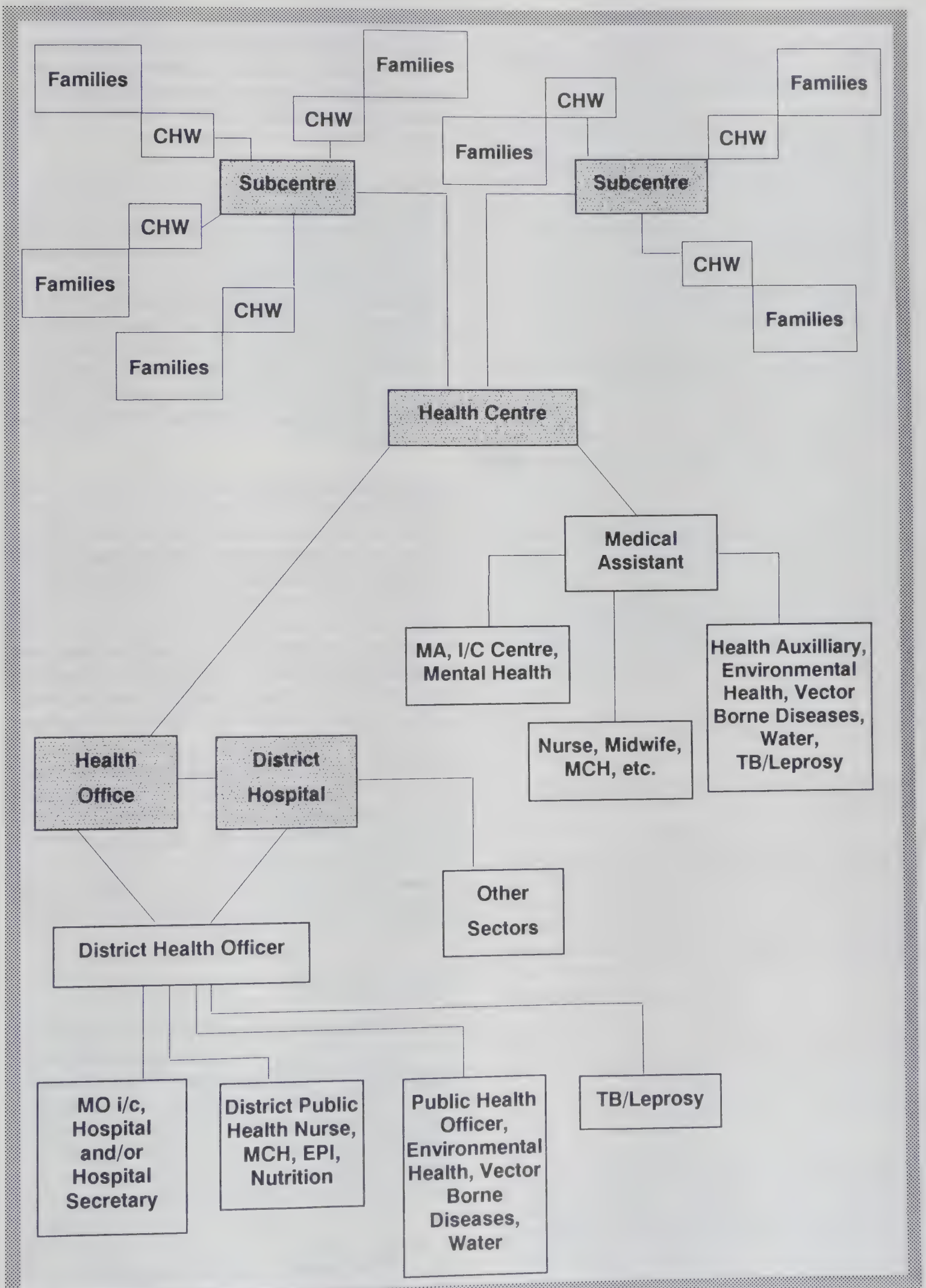


Figure 1. Example of District Organizational Structure (Source: GRA-DHS, World Health Organization)

Table 1. Principal Features of a District Health System Based on PHC

- **equitable allocation of resources** in relation to need
- **accessibility and coverage** for entire population
- emphasis on **health promotion and disease prevention**
- addresses **inter-sectoral** determinants of health as well as health services
- seeks to involve and **empower communities and individuals** to assume greater responsibility for their own health
- comprehensive and **integrated approach** for more efficient use of scarce resources
- **coordinated action** of all health and health-related organizations and groups in district under leadership of district health team

Relationship between District and National Health System

It should be obvious that the district health system functions as an integral part of a national health system, and is closely related to provincial, regional or state levels responsible for direction, guidance and support to district health systems. Thus, it draws its policies and technical directions from higher levels, while having the responsiblity to relate this central direction to the needs and resources of the district, and to the concerns and demands of the district and its people.

Decentralization: A Prerequisite

To ensure that the district health system can play this pivotal role as a mediator between local needs and national policy, adequate decentralization of resource management and planning responsibility is a pre-condition. Decentralization of greater responsibility and resources to districts requires expansion of its role in management and decision-making, as well as planning. This implies acceptance by both national and district personnel of greater district responsibility for ensuring effective implementation of agreed programmes. This will often, however, require development of better skills and knowledge on the part of district health personnel, local politicians and decision-makers, and communities.

It also implies greater flexibility and freedom of action on the part of districts to find the most appropriate balance within each district among the various national programmes and special interests, which are competing for the limited resources of the district health system to achieve their aims. If such flexibility is to be acceptable to all concerned, it will certainly require improvements in existing information systems to ensure optimal decision-making within districts, and adequate accountability, both to communities and to higher levels.

Equity and Coverage

Health for All demands a more equitable spread of health resources, both within districts and countries, and between them. In practical terms it requires special attention to the needs of the weakest and most neglected groups, whose health is usually poorest. It also often requires adjustment of patterns of spending and personnel deployment to put greater emphasis on preventive and promotive programmes, and on areas with relatively fewer resources in relation to their health needs. All of these concerns place new demands on health information systems for disaggregated data on health differentials in different population subgroups. An appropriate response to these demands usually means changes in the information being collected and the ways in which it is processed and used at all levels of the health system.

Intersectoral Action

Another feature of a district health system based on PHC is the attention paid to addressing intersectoral determinants of health and disease. It is often much easier to establish communication among representatives of various sectors within districts than at the national level. This is particularly true when there is local concern about particular problems which require coordinated action. In fact, communities themselves do not think in terms of solving problems within a single "sector", such as health. They are more likely to think as "generalists", looking at a broad spectrum of action which could entail all aspects from agriculture to housing and health, as a means to improve the quality of life in the community. PHC requires that

health workers, in addition to their health care roles, must relate to both communities and other sectors as advocates for improvement in all areas which influence health, even when they are well beyond the traditional scope of the health services.

Community Involvement

> There is now ample evidence of what communities are able to do for themselves when they have the opportunity, the knowledge and the skills needed to play a more active role in planning, operating and monitoring their own community health activities, with the support of the health services.

Chapter 9 provides some new perspectives on what a community-based information system might look like. More difficult, however, is the linkage between this local community system and the health services information system within the district. Indeed, the development of community health information systems adequate for monitoring of progress by communities **or** the health services within the district health system presents a continuing challenge for which there are few models of excellence available.

Many community-based health care (CBHC) programmes have grown up in the past decade, with initiatives from both voluntary agencies and governments. But all too often these programmes have been seen as something separate from the existing health services in the area. If they are to be sustained, however, they must have ongoing support, both technical and moral, from the health services. The provision of such support to communities has significant implications for the health facilities and their staff, who must provide it. Priorities for use of time need to be shifted away somewhat from traditional activities (such as dispensing chloroquine for fever and treating diarrhoea, for example) in order to work with people outside the health institutions to increase their ability to manage simple problems with their own knowledge and resources, while continuing to provide care for more complex problems within the health facilities.

Integrated Services and Coordinated Action

The concern with more integrated health services is based on the dual considerations of greater convenience and acceptability for communities ("one stop service" for all problems) and greater efficiency in integrated systems rather than a multiplicity of poorly coordinated and separate programmes. Another characteristic with more substantial implications for a district health information system is the need for coordinated action and, hence, coordinated information inputs from a variety of partners within the district. Mention has already been made of the difficulty in "appropriating" community information for use at higher levels, given its variable quality, and scope limited to community priorities. But the gathering of standardized information for district monitoring from a variety of private practitioners, non-governmental clinics and hospitals, as well as government-sponsored health services both within and outside the bounds of Ministry of Health authority (parastatal industrial health clinics or military or social security hospitals, for example) may be an even more daunting task.

> The presence of area-based CBHC projects sponsored by private and non-governmental organizations poses special challenges to the development of coordinated action and information for managing the district health system.

The variety of experiences represented at the workshop underlined the complexity of ensuring adequate cooperation and information sharing, especially when different agencies within the same district may have varying priorities, different target groups, and a multiplicity of indicators and data collection procedures in use. Nonetheless, it seemed likely that in an atmosphere of cooperation and good will, these obstacles could be overcome, at least with respect to agreement on a common approach and standard indicators in key areas.

In a district with a multiplicity of separate health services providers, it is usually very difficult to relate health facilities-based activities data to a defined population, unless there is a specific target population served by the facility, as in a clinic for employees of particular organizations, for example. However, it may be possible to look at indicators such as immunization coverage, proportion of deliveries occurring in a health centre or hospital, etc., provided *all* of the institutions providing such services in the district are reporting to the district health management team.

Implications for Change

Above are some of the practical implications of primary health care for district health information systems. The more responsibility taken by the district management team for planning and monitoring district PHC activities in the light of the above features, the more urgent will be the need for new initiatives in information collection and use at all levels, including communities, health centres and district management teams.

COMMON DEFICIENCIES IN CURRENT DISTRICT MANAGEMENT INFORMATION SYSTEMS

Nearly ten years have passed since the Alma-Ata resolution, and much still remains to be done towards the goal of "Health for All by the year 2000". While this workshop was not intended as an appraisal of PHC, given the extensive experience represented among the participants, the workshop could not fail to take note of the continuing constraints and deficiencies in implementation, with particular emphasis on health management information systems. A number of common information system deficiencies are noted below, and form the basis for the subsequent analysis of information needs and uses.

Important Information is Missing

Information about Target Populations

Many district health managers and health centre staff do not know the size of the target populations they are attempting to serve. They are thus unable to think in terms of the coverage implications when reviewing information such as the number of immunizations, new antenatal registrations, or hospital and health centre deliveries. They are also limited in their ability to relate health resources to populations, or to understand the distribution of special risks in the population, such as occupational or lifestyle hazards in certain ethnic or social groups, or even the size of key health target groups such as preschool children and women of child-bearing age.

Information about Outcome and Impact

Existing health management information systems usually have large amounts of data concerning service activities. Some information about inputs such as personnel, vehicles, drugs and financial resources is also readily available in most health facilities. Much less attention is paid to the outcome and impact of health service activities in most information systems, and data related to the effects of these activities is usually very limited. One reason for this is the lack of information about target populations, which is necessary to understand impact in epidemiological terms. However, even in the absence of reliable population data, such simple information as monitoring over time the number of cases of immunizable diseases such as measles or polio is rarely readily available in many district health systems, and even less rarely presented in readily understandable forms such as wall charts or graphs.

Information about Social and Environmental Determinants of Health

Environmental and social determinants of health also need to be included as part of the information base required for an adequate understanding of the health situation of a district. Information about literacy and school attendance rates, and their differences by sex, may point to important areas for intersectoral health action. Knowledge of occupational groups at high risk of disease, such as insecticide poisoning in agricultural workers or malnutrition in families of seasonal workers, may point to areas for promotive and preventive action. Numerous other examples could be cited which might lead to identifying areas meriting action on the part of health and/or other sectors to improve health in a particular district.

Information from All Relevant Institutions

The district health management team often has little or no information from non-governmental and private organizations which are providing health services in the district. This may be because they have not thought to request it, or sometimes because these institutions are reluctant to provide such information. In any case, all institutions in a district health system based on primary health care should be seen as having an important contribution to make to the management information system, as well as to improving health.

Available Data is Inappropriate in Quantity and Quality

Information is Collected but Not Used

In many health information systems, large quantities of data are collected which appear to be rarely if ever used. Often large amounts of time are

spent at various levels on collecting and processing this data. One example, which is readily apparent in many health centres and clinics, is the regular analysis of clinic registers to tabulate attendances by diagnostic category. These analyses, which often require several hours of effort each month in most health facilities, are passed faithfully from level to level through the health system, until they reach the national health statistics unit. This information can, of course, provide some useful information regarding the work load and priorities for action, particularly when presented in a clear way as in Figure 2. The question remains whether this requires comprehensive data collection continuously from all health facilities, or whether periodic sampling of register data from selected units might not provide equally useful information with considerable savings in time, which could be used for more productive activities.

In an efficient and well-organized national system this information may be compiled for the entire country and published within a year or two, ostensibly to aid in national planning. But examine these reports carefully (which is rarely done), and you may well find it difficult to see any significant changes in these patterns in a decade, let alone identify any substantive change of plan or programme in that decade which resulted from these reports. More commonly in many developing countries, this mountain of data from all corners of the country gathers dust in files at all levels, and may finally be tabulated and reported years after collection, if at all. Such examples raise disturbing questions about the relevance and efficiency of many current health information procedures.

Available Information is often Late, Incorrect, Incomplete or Missing

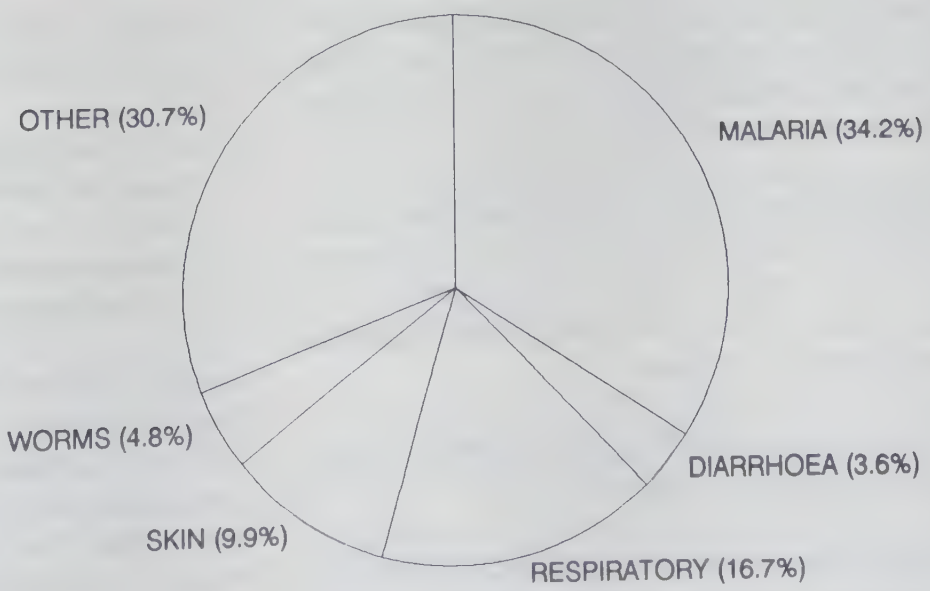
The poor quality, incompleteness and lack of timeliness of much of the data being generated by existing institutional record-based health information systems are frequent complaints noted in MIS assessments. This has its roots in a multitude of causes. But among the prominent causes are the inadequate perception of health workers of the usefulness of their information collection activities, the limited feedback they receive concerning the information reported to higher levels, and the lack of training, followup and supervision concerning their own use of information.

Health Staff Have Limited Skills in Information Processing and Use

Many training programmes for health professionals and auxiliaries pay little attention to such unexciting areas as planning, management and information support for health. Often even epidemiological and statistical skills are given scant attention. It is, therefore, not surprising that when the graduates of these programmes begin their working careers, their skills in these areas are limited. And while programmes such as the Expanded Programme of Immunization have done a great deal to strengthen specific information skills for the programme concerned, very little attention or resources have been devoted to

Figure 2. Leading Diagnoses Outpatient Clinics

Source: Annual Report, Health Information System, Kwale District, 1986. Msambweni Department for Kwale District, Ministry of Health, Kenya, 1987.



general improvement of skills in use of information for better management as a part of continuing education efforts.

Available Information is Not Sufficiently Used for Local Decision-Making

Many health information systems have a tradition of centrally-determined and centrally-processed information, with very limited effort to encourage analysis and use for decision-making at district, health centre and community levels. With increasing decentralization, and the growing level of skills among personnel within the district health system, the possibilities of strengthening understanding and use of information at the level of collection is expanding rapidly.

A number of examples of how information can be used for improving management of the district health system are presented in the following section.

DISTRICT DECISION-MAKING AND USE OF INFORMATION

A sound and workable district health management system requires not only a well-planned and organized administrative and programme structure, but an efficient data management system as well.

In many cases, the district information system appears to serve primarily the needs of the provincial and national levels. The district health management team, however, can often make much better use of the information collected there than can higher levels, for planning, monitoring activities and making decisions concerning the situation within the district.

There are a variety of decision-makers and types of decisions which benefit from a stronger information base. The major levels of decision-makers within the district health system can be grouped as follows:

(1) communities, village health committees and community health workers;

(2) peripheral health workers: medical auxiliaries, sanitarians, nurses, doctors, laboratory technicians, etc. providing direct health services, and often responsible for supervision of community activities;

(3) those responsible for supervision and support of peripheral health workers: usually based at a principal health centre, hospital or district health office;

(4) the district health management team, responsible for overall planning and monitoring of all health activities within the district, for coordinating support from the health services to community health and intersectoral activities, and for linking national plans and priorities with local needs and resources in an operational plan of action.

While there is some overlap, each of these levels have certain information needs unique to their own functions, and others which are of interest to higher levels as well. For example, a community health worker needs information about which children in his area are undernourished, and which children have not yet been fully immunized, in order to provide the necessary information and motivation to these families. The supervisor of this worker may need the names only of those families which are not responding to the CHW, but will want to know the total numbers of each in the village, in order to compare this village with other villages, in order to see where priorities for follow-up supervisory or training action should be directed. Similar examples could be given for individual clinical care, etc. Because of limitations of time, the differences in information needs at each level were not explored in detail. In the examples which follow, the focus has been placed primarily on the information needs of the district health management team for strategic planning and operational monitoring for the district.

The major concerns for district decision-making can be grouped into four categories:

- resource allocation and utilization;
- use of services, coverage and quality;
- policy and strategy;
- assessment of health needs and programme effects and impact.

Each of these areas of concern are discussed below, with more detailed examples for each area in the accompanying tables under headings of decision area, information needs, data sources, data collection procedure and possibilities of microcomputer use.

Resource Allocation and Utilization

Among the most important management functions of the district management team are those relating to the allocation of resources and the monitoring of their use. Decisions such as staff duty schedules and leave, assignment of vehicles, and drug and vaccine management are daily priorities which consume considerable amounts of management time at all institutional levels. A key responsibility is to ensure that available resources are used as efficiently and effectively as possible to achieve the established goals and targets. The main resources available to a district manager are: personnel; drugs and supplies; facilities, equipment and transport; and finance.

Personnel

One major area of personnel information is the deployment by category of worker, and by area and size of population served within the district. This information allows comparison of the distribution of health personnel within the district. This information can also be related to population distribution, and to the distribution of other resources, or to the activities outputs as noted above. Although the authority to transfer workers often lies beyond the district administration, there is often some flexibility available to the district manager to allocate staff within the district in ways which encourage greater usefulness and productivity.

Another important personnel concern for the district management team is the level of knowledge, attitude and practice of health workers in relation to their work. This information is important as part of monitoring the training they have had, and determining what further training may be required to improve their skills and help them to perform more efficiently.

Drugs and Supplies

The rate of usage of essential drugs, with comparisons among the various health units is an important consideration. In more developed districts, this information can be compared with the patterns of diagnosis at the various institutions to provide an indication of quality of prescribing practices. The availability (both shortages and excess due to over-ordering or non-use) of essential drugs and vaccines, including oral rehydration salts and family planning supplies (contraceptives) need to be properly monitored. Where drug supply is not fixed by a higher level, and where it is generally adequate, this information can be used to ensure that future orders are based upon realistic experience rather than random "guesstimates".

Facilities, Equipment and Transport

Each health facility normally maintains an inventory of its equipment to ensure accountability. It is useful to have clear procedures for dealing with breakdowns of equipment. In such situations, they should be repaired or replaced, or sent to a facility where they could be disposed of appropriately.

Maintaining proper vigilance over the use of transport is a difficult task, made worse by the fact that vehicles have many possible uses other than those for which they are intended, and by their very nature are often not under close surveillance. Transport, however, is often one of the major recurrent costs, after personnel and drugs. It is also a critically important resource for ensuring adequate support for peripheral health facilities and for communities. Ensuring that it is being used efficiently and effectively is therefore an important management task. Information about mileage and fuel consumption is simple to obtain from vehicle logs and to analyse to monitor fuel consumption. This can provide information about need for maintenance, or about misuse of fuel. It is more complex, but not impossible, to relate vehicle use to specific purposes, such as health centre supervision, community support, or hospital logistics, and to monitor such use against targets.

Finance

Depending upon the degree of financial decentralization, the district health system may have varying degrees of financial responsibility. Fuel for vehicles, travel and daily allowances for field staff, and funds for office supplies and maintenance of buildings and vehicles are among the items for which some funds are usually available, either directly with the district health office or through the district administration. Chapter 11 deals in much greater detail with cost analysis for the district health system, and some of the types of information which are useful for that purpose.

Areas for Improvement

Some data on most of these items are readily available. But it is frequently under-used for the purpose of monitoring the effectiveness of the health system. Furthermore, existing information systems often make it quite difficult to relate resources to particular activities, to geographic

areas, or to identified high-risk groups or priority activities. It is also uncommon to find information on the outputs and activities of various health units being related to inputs as staff, drugs, etc. in order to compare performance among different areas within districts. Such information can help to identify areas of high and low performance, which in turn can be used as a guide to priorities for training, supervision or other support needs.

Table 2 provides a number of examples of information in each of the major decision areas of resource allocation outlined above. This and the subsequent tables in this chapter are not intended to be exhaustive, or prescriptive, but to provide an indication of the types of data which are considered to be of particular relevance to decision making in district health systems based on primary health care.

With regard to this information as well as the other types, care should be taken to maximize the use of available information before embarking on the collection of new information. And in any case, the decision to collect new information to answer questions such as those indicated above should be made only after careful consideration of the need and usefulness of such information. It should also be noted that the ability to undertake more complex analysis of information should be a pre-requisite to its collection. This ability will often be a function of the stage of development of the district health system and the amount and skills of its staff.

Use of Services, Coverage and Quality

> An equitable distribution of health services and universal coverage with essential care are important features of primary health care. A well-functioning district health management team will be monitoring a number of key indicators of coverage and utilization to determine to what extent the various risk groups in the district, such as mothers and children, are making effective use of the availabe services.

Immunization, growth monitoring and nutrition services, maternal care and family planning, clean water and safe waste disposal, and care of childhood diseases such as malaria, respiratory infections and oral rehydration therapy for diarrhoea, are among the priority health services in most developing countries. It is important that the district management team have current information on its priority service activities, including, where relevant, the estimated target population for each activity and the number (and proportions) of this target population actually provided with services. The monitoring of changes in these coverage figures over time provides a useful indication of how well the district health system is succeeding in its efforts to improve the health of the district. An example of this is shown in Figure 3.

The most reliable data sources for population coverage information are prevalence surveys, but these are seldom feasible on a regular basis. Community health workers' household folders or registers, where reasonably complete and reliable, can provide very useful community-based information. However, these conditions are only rarely met. Where reasonable estimates of the target populations are available, and reporting is nearly complete for the district, health facility records of services such as immunizations can provide a reasonable indication of coverage. However, where there is substantial under-reporting, or a range of alternative services available, as in the case of deliveries by untrained midwives, health facility-based reports are much less reliable as indicators. There is thus a real need for the development of better technologies and indicators for monitoring coverage within district health sytems at a reasonable cost in both time and money. Table 3 summarizes a number of useful information items for monitoring of service utilization and population coverage.

A final mention is in order concerning monitoring the quality of services being provided. In the case of immunization, for example, the integrity of the cold chain is one means by which quality can be monitored. Another is by monitoring the immunization status of all cases diagnosed as having one of the EPI-preventable diseases, to see how many cases have evidence of adequate immunization. Other indicators can be used to monitor quality of treatment services, quality of antenatal or delivery care, or even the quality of supervision or community motivation and support. The assessment of quality is probably most useful when the indicators of accessibility and coverage have reached satisfactory levels, and are therefore less discriminating. It may also be useful to link monitoring quality of services provided with the health workers providing the service, as a means of identifying needs for training or supervision.

Table 2. Examples of Information Needed for Allocation and Management of District Health Resources

DECISION AREA	INFORMATION NEEDS	DATA SOURCE	DATA	POSSIBILITIES OF MICRO-COMPUTER USE
Personnel Deployment	Number of Active CHW's by Supervisory Health Facility and Population	Health Centres	Biodata of CHWs, Routine Records (Registers)	None
Personnel Training and Supervision	Knowledge, Attitude and Practice of Health Workers in key skills	CHW supervisor records kept at health centres	Routinely collected information through informal checking by supervisors	None
Drugs and Supplies	Quantities of particular items remaining at each health centre at the end of 3 months	Health Centre Records/ Inventory	Routinely collected information	Moderate
	Utilization patterns by population covered and by type of supplies	Health Centre Records Special Studies	Routinely collected information	Moderate
Vehicles	Mileage for supervisory and related services	Vehicle log, activities records of supervisors	Routinely collected information	None
Finances	Of budgeted funds: amount released to date, amount to be released in the forth-coming quarter	District Accounts Officer	Routinely maintained accounts register	Limited (depending on the levels of funds available)

Policy and Strategy

Given the critical role played by the district as a mediator between national plans and local needs, it is obvious that knowledge, both of national plans, strategies and targets, and of local plans, priorities and resources, is essential for district health personnel. While this information is usually documented in detail in official documents at the national level, in many countries, the district health management team may have limited or no knowledge of these documents.

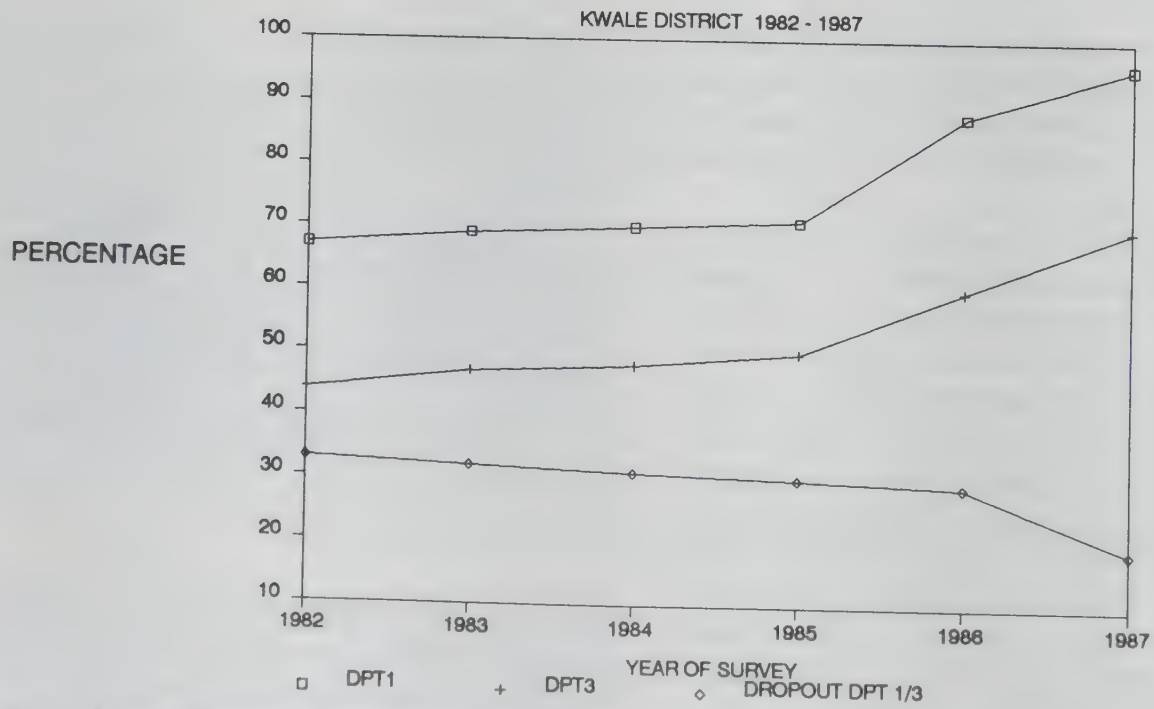
The district health team will also need to coordinate its plans from the early stages with the plans of other sectors such as agriculture, education and community development. There are usually procedures available to develop, assess and incorporate proposals from communities in the overall district planning process. Where there are plans by vertical or other programmes from higher levels for centrally managed activities in the district, information about these activities should be communicated to the district, so they can be coordinated with other health activities.

Information about specific district targets is often provided to districts by national programme managers. The involvement of the district team in setting these targets varies from country to country. In general, involving the district team in the establishment of targets, in consultation with all levels within the district health system, has the dual advantages of providing more realistic targets than those which are centrally determined, and of building commitment within the district to meet these targets.

The district health system will usually rely on technical expertise from the provincial or national level to assist in the selection of alternative strategies and tactics, and the choice of technology for the solution of specific problems. Technical guidelines for the district, based upon the most current and reliable technical knowledge from scientific and field studies, can be very helpful to district personnel, although it requires periodic updating in the light of new knowledge. This technical guidance must be combined with information about the local situation in order to develop appropriate plans of action.

It is usually at the district level that policies, objectives and targets must be translated into operational plans which specify *who* is responsible for *what* actions, *when*, *where* and *how*. The information needed for this process includes not only national policies and plans and the technical guidance noted above, but also information about personnel, transport and financial resources within the district, the past performance of the health services for each programme, the accessibility, interest and receptiveness of communities to particular programmes, etc. Based upon this

Figure 3. Trend in Immunization Coverage



Source: Annual Report, Health Information System, Kwale District, 1986. Msambweni Department for Kwale District, Ministry of Health, Kenya, 1987.

Table 3. Examples of Information Requirements Concerning Utilization and Coverage of Primary Health Care Programmes

DECISION AREA	INFORMATION NEEDS	DATA SOURCE	DATA	POSSIBILITIES OF MICRO-COMPUTER USE
Target Population	Age and Sex	Census Reports	Stratified by area	Strong
	Level of Education			
	Socio-economic Status			
Immuniza-tion	Immunization Given	Clinical records, Campaign registers	Coverage by Vaccines	Strong
	Target Population (<5) Covered by EPI by Service Area	EPI Cluster Surveys	Stratified by area	Strong
	Supply Status of Vaccines	Stock Records	Quantity used by type	Strong
	Cold Chain Adequacy: units of equipment and working order	Inventories, Spot Checks, Temperature Records	Number of equipment on order	Limited
	Surveillance/ Trends	Health facility	Disease surveil-lance reports	Strong
Nutrition/ Growth Monitoring	Target: all Children <5 screened for Malnutrition	Clinical Records, CHWs Family Folders	% Malnourished children covered by level of malnutrition	Strong
	Intervention Ac-tions: Supple-mental Feeding, Mother's Education Long-term Efforts	Clinical Records, CHWs Reports, Project Activity Report	Coverage stratified by level of success	Moderate
	Follow up Actions: Home Visits, School Education Programmes	Project Activity Report, CHW and Special Reports	Coverage by level of success	Strong

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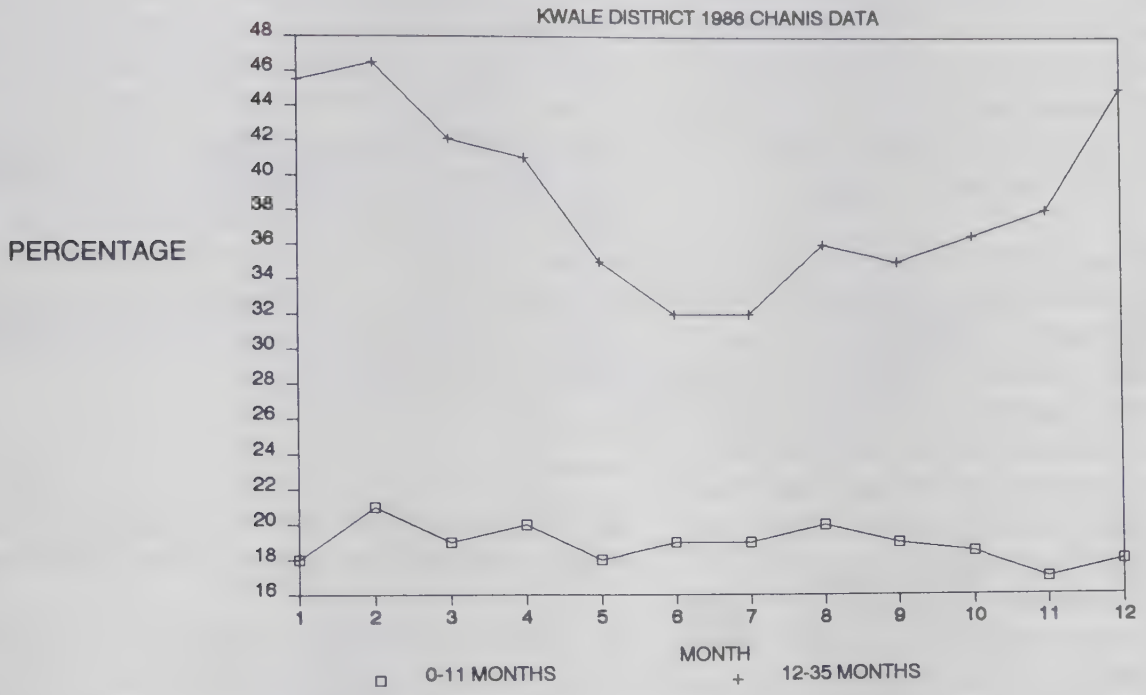
Table 3. -- continued

Examples of Information Requirements Concerning Utilization and Coverage of Primary Health Care Programmes

DECISION AREA	INFORMATION NEEDS	DATA SOURCE	DATA	POSSIBILITIES OF MICRO-COMPUTER USE
Maternal Health	Antenatal Services: Pregnant Women under Surveillance, Immunization against Tetanus, High Risk Deliveries	OPD/CHW Records and TBAs	% Pregnant Women: followed by OPD, CHWs, TBAs, % fully immunized (2 doses)	Strong
	Deliver/Postpartum: No Risk Deliveries, Postpartum Issues (LBW)	OPD/CHW Records and Records kept at other facilities	% Delivered in: OPD Facility by Attendant, % Live Briths % Safely Delivered, % Requiring interventions/ referrals	Strong
	Followup of Mothers/Newborns: Home Visits, Infant Surveillance/ Well Child Care, Immunization, Growth Monitoring	CHWs/TBAs Records, Facilities Records, CHWs Family Folders	% Mothers Delivered Visited by CHWs by Risk Type, % Low babies under control	Strong
Family Planning	Information/ Education, Supplies	CHWs Family Folders, Special Studies	% Married females in reproductive ages interested and using FP methods, % Mothers who had delivery using FP methods	Strong
Diarrhoeal Disease Control	Diarrhoea Incidence, Management, Trends	OPD Records, CHWs Folders, Special Studies	% Mothers using ORS	Strong

Figure 4. Seasonality of % Underweight



Annual Report, Health Information System, Kwale District, 1986. Msambweni Medical Records, Department for Kwale District, Ministry of Health, Kenya, 1987.

information, realistic targets can be allocated to different units and personnel within the district health system, and these targets can form a firm basis for both individual units and their supervisors to identify the areas which are proceeding satisfactorily, and those which require special attention because they are not developing according to plans.

While this section appears to refer primarily to governmental planning processes, it should be emphasized that where non-governmental and private institutions play an important role in the district health system, they should also play a role in the operational planning processes in the district, as well as sharing in the responsibility for agreed activities and targets.

Assessment of Health Needs and Programme Effects and Impact

The areas of needs and impact assessment are of prime importance for the planning and management of district health systems based on PHC. They are considered together here because the information requirements for both are closely related. While the terminology of "needs" and "impact" suggest two different activities, both are stages in the circular managerial processes of planning, implementation, evaluation and replanning.

Needs assessment for primary health care requires knowledge of health policy, health status, health determinants and risk factors, demographic, socio-economic and environmental factors, and health services coverage and utilization.

As most of this information changes over time, it is helpful to have information on the changes in key variables over a period of several years. For local planning and monitoring, it is often relevant to have information about cyclical and seasonal changes during the course of the year as well. For example, Figure 4 shows the changes in the frequency of underweight children monitored by the district nutritional surveillance programme. Variations such as these commonly reflect seasonal changes in the availability of food within the cycle of agricultural production.

The same figure demonstrates well another important point. By looking separately at the rates and patterns in infants and in children aged 1-3 years, two useful points are obvious. First, the percentage of underweight children is much higher in the 1-3 year age group, reflecting the common increased vulnerability and risk of malnutrition in children in the weaning period.

Second, the seasonal changes are not seen in the infants less than one year of age, perhaps reflecting the greater stability of their diet which is likely to be primarily mother's milk. Information about such patterns can help to identify when to concentrate activities such as health education or other interventions on specific issues, based on period of highest risk or demand.

Some information regarding the above items is usually available from a variety of sources, such as censuses, health statistics, evaluation, research and other special studies, and reports from planning and other sectors. Unfortunately, information for each district may be unavailable for a number of key indicators. In this case, use must be made of educated guesses, unless resources are available for additional special studies and surveys. As assessments of need, effect and impact require information about the total population, censuses or special surveys may be the only means of obtaining accurate information. However, the cost of obtaining additional information must always be weighed against its value in improving specific decisions. In many cases, the district health team may be able to make appropriate decisions for planning and implementation on the basis of the limited information available. Where new activities are being introduced or in special projects where the evaluation needs are more stringent, it will usually be necessary to supplement routine situation analysis, monitoring and evaluation activities with some additional community surveys to be able to measure effects and impact adequately.

The choice of indicators for monitoring primary health care has been the subject of extensive thought and action. Several examples of reference indicators are provided in Appendix B of this publication. This technical working group felt strongly that, with the exception of a very limited number of standardized indicators for national (or international) comparisons, the choice of indicators should be flexible and based upon local priorities and programmes, which were expected to change over time. It is, therefore, essential that the selected indicators be reviewed regularly for relevance and usefulness as a part of planning and monitoring processes. An illustrative example of some information requirements for assessing need and impact are shown in Table 4. In the context of planning and management of district health systems, special note was taken of the need for a periodic and careful district health situation analysis. One useful model for this process is the Primary Health Care Review methodology developed by WHO. This process involves health personnel from various levels in assessing the performance and coverage of health services, and the extent of community and intersectoral involvement and action. It includes household sample surveys to assess both need and coverage of services, and management and performance assessment of health facilities at various levels. This information is then analysed to identify the major progress and weaknesses in the health system, and to recommend practical means of improvement. This methodology is currently being adapted for use as a tool for self-analysis by district health teams.

GUIDELINES FOR IMPROVING DISTRICT MANAGEMENT INFORMATION SUPPORT

Several guidelines are suggested below regarding ways to improve the collection and use of information for better management within the district health system. These guidelines are aimed primarily at district health management teams, but may be useful to persons at all levels who are concerned with strengthening the capacity of districts to effectively manage their own primary health care programmes.

Emphasis here is on ways of strengthening management information systems regardless of the type of supporting technology available. Nearly all of these guidelines are relevant to districts irrespective of whether or not they have access to a microcomputer. The section which follows this one will specifically address the role and potential contribution of microcomputers to this process, including indication of some of the criteria to be considered in deciding whether microcomputers are appropriate for the district health system at a particular point in time.

Increasing the Scope of Available Information

> One of the most critical constraints of many existing district health information systems is the lack of an adequate epidemiological base concerning the size and characteristics of the district population and important subgroups within that population.

Without such population-based information, it is impossible to do even the most basic types of monitoring of key primary health care indicators.

Table 4. Information Requirements for Needs and Impact Assessment Within District Health Systems

DECISION AREA	INFORMATION NEEDS	DATA SOURCE	DATA	POSSIBILITIES OF MICRO-COMPUTER USE
Demography	Fertility, Birth, Death, Growth Rates	National Census, Demographic Projections, Sample Surveys	Quantitative stratified by age, sex and area	Strong
Health Status	Morbidity, Mortality, Child Growth and Development, Immunization	National or provincial statistical profile, Service records, Periodic surveys, Special studies including KAP	Quantitative stratified by age, sex and area	Strong
Socio-economic	Education, Employment Opportunities and Income, Lifestyles, Women's Status	National or provincial statistical profile, Service records, Periodic surveys, Special studies including KAP	Quantitative stratified by age, sex and area	Strong
Environ-mental	Water Supply, Energy Sources, Sanitation, Housing, Com-munications (roads and transportation)	National or provincial statistical profile, Service records, Periodic surveys, Special studies including KAP	Quantitative stratified by area	Strong
Health Services	Accessibility, Adequacy, Quality of Care	National or provincial statistical profile, Service records, Periodic surveys, Special studies including KAP	Quantitative stratified by area	Strong

While surveys in every district are clearly not feasible, it should be possible to ensure that every district health management team has access to at least a minimal set of demographic information for the district, and to key rates such as births, deaths and infant mortality rates for the province or the nation, if not specifically for its own district.

This minimum set of information, along with reasonably complete service delivery information for the district and some supplementary community-based information, should permit at least a reasonable core of information with which to assess health progress in the district. It is a manageable challenge for most districts to be able to identify expected events, such as pregnancies and births expected each year, and to use them as denominators for comparison with the numerators that are collected routinely by health facilities.

In districts with more developed information systems, data from other sectors concerning important health determinants can be added to the core information. The Thailand "Basic Minimum Needs Indicators" in Appendix B2 provide a useful practical example of how this might be done. Where ever possible, it is also helpful to disaggregate district data to sub-district populations, as well as by age, sex and economic or employment status, in order to recognize higher risk areas and groups, and to identify particular areas or target groups for more concerted action.

Another area for expansion is in the various institutional sources of health services information within the district. There is often scope for greater mobilization and sharing of relevant information from non-governmental, private and community health services, in order to obtain more accurate and comprehensive information regarding key indicators for the district.

Clarifying District Needs, Resources, Objectives, Targets and Indicators

A key first step in district planning is the preparation of a district profile, containing information about health status, risk factors, health resources and activities within the district. Particular attention should be paid to non-governmental and community resources, with a view to strengthening coordination and collaboration to improve health in the district.

Major improvements in specification of objectives, targets and indicators is a prerequisite to strengthening information and monitoring of progress in most districts. To be most useful for this purpose, targets and indicators must be clearly defined, based on information which is or can be made available, and insofar as feasible should make use of measures for which baseline information is already available from which to assess progress. It is rather meaningless, for example, to identify as a target "the reduction of the incidence of diarrhoea by 15% during the coming year", if the current incidence in population terms is not known and there is no system in place for monitoring the frequency in the population in any case. A more feasible indicator in this area might, for example, be the reduction of the hospital deaths due to diarrhoea in young children by 30%, an indicator which is less useful in terms of the extent of the problem in the district, but which can at least be monitored with available information.

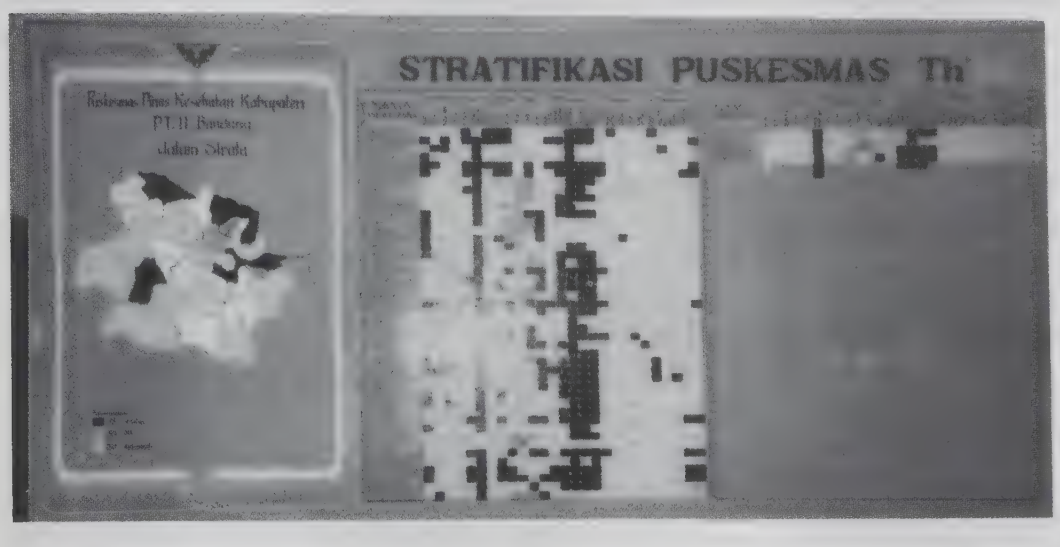
In addition to traditional types of quantitative health service and health status indicators, more qualitative indicators might be introduced to monitor such things as the reorientation of health staff and their activities towards greater support of community-managed health activities, the involvement of communities in local health decision-making, and the strengthening of intersectoral collaboration in the district. Such indicators can be as important and useful in monitoring changes in these areas as more traditional indicators.

Streamlining Procedures for Data Management

One important area for streamlining procedures is the elimination of the routine collection and processing of data not needed for decision-making.

This choice is rarely the perogative of district managers, however, since most information system requirements are prescribed in a top-down manner by national programme managers and information specialists. This means that serious efforts to improve the district information system in this direction will require leadership from the national level.

Integration of information collection procedures and forms is another area for improvement. It is



Indonesia district wall chart of health centres stratification. Local women's organization registering children at posyandu (community-organized MCH clinic). (Photo by H. Jansen, WHO)

not unusual in some countries to find several different kinds of child health records, all with growth charts and immunization records, some issued by the immunization programme, some by the nutritional surveillance unit, and some by the maternal and child health services. Such a situation is wasteful and confusing. Again, the district staff are the victims of poor planning and coordination of information efforts among competing national programmes, and national attention must be directed to resolving these inefficient procedures.

In many countries there are few guidelines for the analysis and presentation of information for district or health centre use, with the exception of some of the specific programmes such as EPI and nutrition. The development of such procedural guidelines, related to the information system and requirements of each country, could make a substantial contribution to improving the analysis and use of available information. In this regard, procedures for analysing data for comparing different groups or different areas within the district might be particularly helpful.

A final area for improvement to facilitate the use of information for decision-making is in the area of procedures and formats for graphic presentation of information in the form of maps and charts. Some countries have developed such procedures so well that every health facility has graphic displays and maps on its walls indicating the progress of priority activities. The above photograph presents an unusually well-developed example of such a display. In addition to displaying geographic relationships, maps can be used to indicate the location of families requiring follow-up action within the community or the district, or of special high-risk situations. Maps can also be used to show quantitative information, as in Figure 5, which demonstrates the growing

Figure 5. Female Literacy Rate, by District

Produced with the WHO/HST Atlas of Map-Linked Data Bases

possibilities of linking maps and databases with the aid of a microcomputer.

Improving the Skills of District Staff in Management and Use of Information

The introduction of the types of changes indicated above have certain implications for the training of health personnel in districts. In many cases there will be a need to improve the skills and capacity of staff in information collection, analysis, presentation and use. Where microcomputers are being introduced as a part of MIS improvement, the training requirements will be even more substantial, as the technological and procedural changes will be more extensive.

Another area worthy of attention is the reinforcement of information skills as a part of supervision, in-service training, and information feedback activities between peripheral health workers and their supervisors. In addition to direct effects on the information reviewed with staff, and strengthening the capacity of peripheral workers to use information for their own work, more attention to information in the course of supervision is likely to increase motivation of staff to manage information better, yielding indirect improvements in quality as well. What applies to supervision of peripheral health workers by their supervisors can in turn be applied to supervision of community health workers by peripheral health staff, with appropriate reinforcement of information skills at that level as well.

Broadening the Use of Information, Particularly Within Districts and Communities

> One of the strongest motivations for ensuring the quality of information being collected is a personal interest in its local use. Improving the understanding and use of information by those who collect it, particularly in communities, at health facilities, and among the district health management team, thus contributes not only to better management, but also to improving the quality of the information itself.

The use of specific information regarding activities, such as clinical encounters at the health centre is well understood by most health workers. It is when we attempt to broaden the views to these workers to see not just the individual encounters, but their relationship to the health of the district or health centre area, that the difficulties begin. Nonetheless, it is possible to encourage greater involvement of peripheral health service workers in identifying relevant priority activities and realistic indicators of progress for these activities in their own areas of work.

A further extension of the use of indicators by individual health workers is in moving beyond monitoring activities towards the use of indicators for self-assessment of **quality** of work by health workers and communities. Wider use of such on-going quality assessment could help to promote a constant improvement of the ways in which services are provided, thus facilitating progress toward Health for All goals. The experiences in self-assessment of quality of work in industry, beginning with the work of Deming were considered relevant to health care as well, and worthy of wider application. However, such an approach must be understood and endorsed by senior Ministry of Health managers in order for the district health management team to be able to expand in this direction.

The use of information extends beyond the health services to community health initiatives, including community planning, management and information collection. There is a need for new and innovative approaches in adapting health information systems to the needs and capabilities of communities, accompanied by the necessary support from the health services.

Mention has already been made of the use of information to monitor differences in problems and performance among sub-districts to guide supervision and support activities. Similarly, provincial and national levels can use available information to monitor differences between districts as a means of encouraging improved performance, identifying problem areas and guiding resource allocation.

ROLE AND POTENTIAL OF MICROCOMPUTER SUPPORT FOR DISTRICT HEALTH SYSTEMS

The major potential uses of microcomputers for MIS support within District Health Systems are the following:

- **Management:** monitoring, resource allocation, decision-making support
- **Administrative tasks:** budget, accounting, activity records, personnel, inventory, typing and reports

- **Research:** special studies, data analysis, etc. (see Chapter 12)

- **Planning:** projections, modeling, decision aids (see Chapter 13)

There are a number of factors to consider in determining whether or not to use microcomputers for operational support within the district health system:

- The state of development of the country and its health services, including the availability and use of microcomputers at higher levels within the health system;

- The general level of computer use and computer literacy and availability within the country;

- The availability of hardware maintenance and training and support capability within the district;

- The capability to support recurrent costs, such as paper, supplies, diskettes, etc., at an adequate level to maintain operations;

- For use on a wider scale, the availability of foreign exchange within the country and national priorities for its use may be a consideration, as well as the questions of creating long-term dependency on external suppliers for both hardware and software.

While it was agreed that microcomputers had considerable **potential** to play a useful role in supporting district health management, it was also recognized that there were many non-technological factors to be considered in introducing microcomputers at the district level. On balance, it was agreed that there were a number of developing countries where it was appropriate to introduce microcomputers for support to district management information systems at the present time. However, introduction on a wide scale for routine management support should proceed with caution, particularly in the poorer developing countries. On the other hand, there was general agreement that where resources and technical support were available, the use of microcomputers could be strongly encouraged for special studies and research, and for monitoring and management support in health projects with substantial data requirements. In most situations in developing countries, it does not seem appropriate to recommend the use of microcomputers for management information support at the level of health centres and below. However, with growing use at district level, wider availability of support capability outside district capitals and continued decreases in initial costs, it is likely that the feasibiliy of further expansion of use to this level will increase.

The introduction of microcomputers into district health systems ought to be preceded by a careful analysis of information needs (see "Information audit", Chapter 12). The limited experience to date indicates the importance of focusing first on the information requirements, and only secondarily on the role of the microcomputer.The microcomputer is a powerful tool, but it is not a panacea capable of generating useful information from inappropriate and unreliable data. On the other hand, the introduction of a microcomputer can itself be a powerful motivator for change and improvement in the information system, partly on the basis of its technical demands for clarity of thought and detailed specification of procedures, and partly because of its glamour and motivational value.

> In the introduction of microcomputers into any new situation, adequate attention must be given to both training in specific skills, and dialogue and communication to allow participants in the process to adapt themselves comfortably to new ways of doing things. In this respect the introduction of microcomputers must be seen as similar to any process of organizational change.

The need for training and sustained support over a period of time, which may extend for many months, should not be underestimated. This may be much less of a problem in the case of a single highly motivated user, but even microcomputer veterans continue to find new challenges in the obscurantism of software and hardware manuals and the undocumented ways computers find to confound their unsuspecting users.

The introduction of microcomputers into district health systems has the potential to greatly facilitate the improvement of management information systems in many of the areas identified above. At this point in time, decisions on the introduction of microcomputers at the district level should be made on the basis of evident interest and capability for use among personnel within the district,

availability of adequate training and support for introduction to district staff, and availability of appropriate software and hardware for the desired applications. Where the necessary preconditions for appropriate use are present, microcomputers can be firmly recommended as a very useful part of district efforts for MIS improvement.

IMPLICATIONS FOR POLICY AT NATIONAL AND INTERNATIONAL LEVELS

If committment to primary health care and the empowerment of people to take greater responsibility for their own health is to be realized, **the demands of national and international agencies for programme information from local levels will need to be sufficiently flexible to allow, and even encourage, greater community involvement in choosing relevant indicators and information needs for monitoring the effects of their action**. In this context, obligatory reporting requirements, particularly from community programmes, must be kept to a bare minimum, and **greater local participation in the selection and use of indicators for monitoring progress in health development should be strongly encouraged**.

National and international agencies should **encourage greater decentralization of authority to the district health team to strengthen them in their difficult role of mediator** between central information demands and local information needs, in order to encourage greater community initiatives.

International bodies and national governments should **encourage the wider application of microcomputers at various levels within the health system as a part of national, provincial and district efforts to improve health management information systems**. Such applications should be accompanied by appropriate changes in information procedures and requirements, and by additional training in the appropriate use of information.

Because microcomputer applications are still in their infancy in the support of primary health care in developing countries, international and bilateral agencies working in these countries should make every possible effort to facilitate the process of learning and exchange of experience among countries and agencies in ways to make the best use of this new and exciting technology. Case studies of both successful and non-successful experiences should be documented and publicized. Consideration might also be given to supporting the development of appropriate software and training packages for primary health care management, as well as better tools and techniques for improving other aspects of management and information support in districts.

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Cost Analysis in Primary Health Care Management Information Systems

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INTRODUCTION

WHY IS COST INFORMATION IMPORTANT?

- ACCOUNTABILITY AND CONTROL
- PERFORMANCE AND EQUITY REVIEW
- PLANNING AND FORECASTING

THE UTILITY OF COST INFORMATION IN PHC

- FINANCIAL AND RESOURCE INFORMATION AT THE COMMUNITY LEVEL
- FINANCIAL/RESOURCE INFORMATION FOR USE AT PERIPHERAL HEALTH UNIT LEVEL
- COST ANALYSIS AT DISTRICT LEVEL

IMPLEMENTING FINANCIAL COMPONENTS IN PHC MIS

CONCLUSION: IDEAS, ISSUES AND PROBLEMS

MAJOR RECOMMENDATIONS

INTRODUCTION

What does cost analysis offer to primary health care (PHC) programme planners and managers? Perhaps some PHC managers see threats in too-close an interest by economists, accountants or auditors in their activity, expecting budget cuts or increased charges as possible results of such scrutiny. This has already happened in many Ministries of Health. Resources for health, whether from government or international assistance agencies, are diminishing in terms of per capita allocations. Programmes and components of programmes have to be shown to be cost-effective if they are to continue receiving financial support on a competitive basis. Cost-effective programming is often hard to achieve; it is not, unfortunately, an automatic consequence of well-intentioned, "common sense" decisions to promote improvements in health status.

PHC has tremendous potential to improve at low cost health status and the quality of life, as preceding papers have shown.

> Abundant evidence exists to show that life-saving PHC interventions can be implemented for two dollars per capita per year or less. But PHC can waste scarce resources when it is badly managed, inappropriately organized or wrongly targeted.

In the present context of the world economy, it is of paramount importance to support economically sound programmes and to stop wasteful ones. Unfortunately, many Ministries of Health and other health organizations have weak analytical capacities. This is reflected, for example, in the distortion of health sector spending in favour of urban hospitals and curative services. Ministries of Health have not, in general, been very successful in reallocating resources to the less expensive services that have a greater capacity to meet the predominant health problems of the majority of people. Moreover, Ministries of Health are typically weak bargaining partners in negotiations for allocating national resources, particularly during periods of economic crisis. This has had -- and is likely to continue having -- grave implications for the small and shrinking share of the health budget allocated for PHC.

Cost-effectiveness entails more than its formal definition implies (see glossary). In essence it relates measures of **input** (human and financial resources) to measures of **output** (e.g., immunized infants or diarrhoea cases treated) and **impact** (reduction in infant mortality). This involves

a systematic approach to analysing problems, a new perspective on and criteria for resource allocation that is quite different from that currently practiced by managers.

> The cost analysis approach provides PHC programme managers with the most durable defense of their budgetary allocations and other economic interests.

Management of health services is often characterized by deep and frequently unproductive divisions of responsibility and "fragmentation" of management tasks. This is particularly acute in the separation of financial management from service provision responsibility. From the district perspective, financial and service reporting channels are upwards, not horizontal: the district medical officer (DMO) is unlikely to know what it costs for an outpatient consultation, or treatment of malaria at a health post. Worse, he/she is unlikely to have the need to ask, as monitoring the economic efficiency of health interventions rarely appears in the DMO's job description. Thus, there often exist two totally separate information systems: one for finance, and one for epidemiological/utilization records. Making sensible statements about the PHC purposes to which public money is devoted is consequently prevented by existing management information systems.

Much of what follows is concerned with finding simple, inexpensive methods to combine relevant pieces of these two systems to allow at least rudimentary cost and effectiveness appraisals.

In community-based PHC programmes this divorce of responsibilities is potentially and, in many cases, actually avoided. The community health worker often has both a financial *and* a service provision role as, for example, in the Kisumu PHC Project where the CHW operates a simple imprest account for a limited range of pharmaceuticals, collects and safeguards the fees, and uses the accumulated revenue to replenish stocks. This contrasts sharply with the pharmaceuticals supply arrangements in most health service organizations, where unpriced stocks are supplied (when available) to health facilities, and distributed (sometimes in wastefully small or large quantities) to patients who make no payment. Community-level PHC programmes have information needs similar to those at district or national levels, but the type of community-level information collected, and the method and use made of it, can be determined best at the point where it is to be used -- in the community. This gives great potential flexibility for more appropriate data generation and handling.

WHY IS COST INFORMATION IMPORTANT?

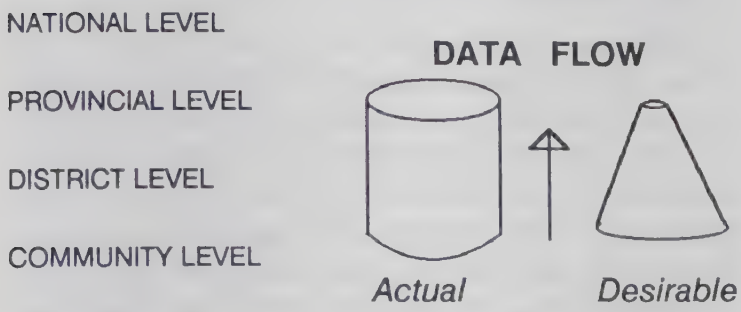
Accountability and Control

Costs are most simply defined as "the value of resources used". Their importance derives from the fact that resources are limited. Committing resources to well-digging prevents their being used for latrine building; and allocations to medical care services is at the expense of allocations to immunizations or other interventions which could prevent the disease -- and, ultimately, the disproportionally high spending on medical care! Other resources may be found, but still the total supply is finite, so at some point the decision must be made to trade off further spending on some health interventions in favour of others.

The limited (and thus valuable) nature of financial resources is the driving force behind accounting systems. Because money is scarce, it is desirable to control its use closely, and to require that those spending it are accountable for their actions. Accounting and audit systems identify misappropriations, (i.e., spending on things other than those items or purposes for which budget approval is given), as well as overspending and underspending. These are important concerns, and the accounting system makes embezzlment, extravagance or slowness conspicuous. Measuring and monitoring economic efficiency issues such as cost-effectiveness cannot be achieved in an information system which is only concerned with *inputs*. Inputs are only one aspect of what managers need to consider. While information on inputs clearly belongs in a MIS, the accounting system alone is an inadequate basis for management decision-making. A commentator on Ghana's health budget observed:

> *"As it stands at the present, the budget is, for someone interested in finding out resource allocation in terms of actual health functions, a most unfathomable document ... it will ... prevent meaningful discussion on health resource allocation."* (Ofasu-Amah, 1975)

The need for accountability means that budget authority flows from the top down in health systems, and spending details flow from the bottom up. Since little or no analysis or elimination of unnecessary data occurs at intermediate levels, financial data travels *en bloc* rather than in an increasingly selective core, thus:



The volume of financial data in the health sector is considerable, though its value as an aid to managers is severely limited by both its input-based format and its separation from service process/provision or outcome information.

Programme or output-oriented budgets offer, in principle, a way to improve the management relevance of the budget. Instead of simply describing input purchases, an output-oriented programme budget format allows spending to be identified by broad policy objectives and programme priorities. A number of countries have introduced programme formats into their health budgets, but the scale of change in procedures is so substantial that it can usually only be considered in the context of more systemic reforms.

Control and accountability, the original purposes of financial information systems, will continue to be essential requirements in any such system. No additional information is required to allow financial managers to discharge their audit responsibilities. These narrow financial management objectives have been critically characterized as amounting to no more than "never knowingly underspent."

At community level, where the management environment may be substantially less formal, people will expect to have basic income and expenditure record-keeping maintained by their local health worker or health committee. They may also require analytical financial information from time to time to help them assess the affordability of various local action projects, such as water-supply or environmental improvements.

Performance and Equity Review

> Merging financial data into a unified MIS offers the PHC manager vastly improved possibilities of informed decision-making on a much wider range of management issues and of achieving far more efficient use of scarce resources.

As the next section illustrates, rough measures of efficiency may be obtained by analysing costs in relation to the activities of individual health workers or facilities. Anomalies in the cost- per-unit-output among health workers or facilities may be identified; where these cannot be justified by any obvious factor, such as morbidity differences, some reallocation of resources may be indicated to avoid waste. This is not cost reduction *per se*, but it does improve efficiency. **A transfer of resources from a low productivity or high cost area to a high productivity or low cost area allows greater total output for no additional cost.** Such possibilities may be common in PHC where, for example, staffing or drug supply patterns at health centres do not relate to total workload. For these to be identified, cost information has to be juxtaposed with service information.

Fairness in the distribution of health resources can also be monitored: per capita expenditure data provide an index of equity in the availability of PHC. The merger of financial and service information also allows managers to review their relative situation vis-a-vis other management units, whether districts or sub-districts. Trends and levels of per capita expenditure -- commonly lowest in both rural and urban zones of greater need -- provide a firm basis on which the entitlement of relatively under-resourced districts can be demonstrated.

Planning and Forecasting

The planning of PHC developments over the medium term future also necessitates the use of expenditure and income data. Existing local cost patterns are the best guide to likely future requirements; and an analysis of trends in fee income and financial support from other sources provides a yardstick by which to judge the likely feasibility of financing planned development. **Simple modeling -- altering the assumed cost and revenue projections and observing the**

effect on planned targets -- is a desirable way of building flexibility and realism into plan design. Patently unsustainable plans may be identified, and wasteful expenditure on capital which cannot be properly operated may be avoided. **Versatile microcomputer software in the form of spreadsheets provide a fast way to identify and assess alternative plans**, and allow the results to be presented in useful graphics for greater comprehension and interpretation of results.

Cost information has several potential uses in addition to its traditional role of accounting. Advocacy, planning and forecasting, and performance review are essential management tasks which can be more effectively executed by the availability of up-to-date financial data.

THE UTILITY OF COST INFORMATION IN PHC

Three groups with different interests in financial information are:

(1) **those who provide funds/resources**,

(2) **those who provide health services**, and

(3) **those who use health services**.

In some circumstances, a broadly-defined group may function as all three: a community which mobilizes its own funds to support local health services and community health workers, essentially acts as financier, implementor and customer. Usually, however, it is possible and helpful to distinguish them since each group will have differences in access to, demand for, and capacity to analyse financial information.

Those who provide resources will generally demand (and are certainly entitled to have) an account of how their contribution was utilized, to what effect, and whether there are better ways of using it. They rely for this information on the implementor. The implementor is accountable to the funder, who has ultimate financial control. The implementor often has limited financial control, but considerable decision-making power regarding resource use. This control often diminishes with proximity to peripheral health units.

Users have the most direct interest in ensuring that the best quality of health care is provided. They can to some extent influence the nature of health programmes provided, through the degree to which they patronize services, though this capacity is severely limited in environments where choices of alternative health services are few or nonexistent. Direct control over resource allocation is rare unless users are also funders. However, users can lobby for change and **information about resources and their effectiveness can be used as a most persuasive advocacy tool**.

These three groups are represented in varying ways at the different levels in the district health system. The DMO and peripheral health units will generally be implementors, receiving funds from elsewhere. The community, always potential users, will sometimes also be financiers and implementors. In the following sections we discuss for each level -- district management, local health services and community -- information requirements, how this data should be collected and from whom.

Financial and Resource Information at the Community Level

Financial information at this level may come from two (or more) sources:

(1) that generated by the community itself; and

(2) that provided to the community by health service implementors at the peripheral level.

A community which funds and manages its own health programmes is a largely self-contained unit: it has access to certain basic financial data and the motivation to use it. It would probably benefit from some assistance as to how to use this information, although the familiarity with financial matters that some members will undoubtedly have and their capacity to analyse financial data should not be underestimated. Traders for example, usually have considerable facility with figures.

A basic demand from the community will be for an adequate accounting for the contribution they have made. To satisfy this, the community treasurer of the programme will need to provide a clear statement of **income** (total, and perhaps by group of sources) and **expenditure** (total, and a detailed item by item expenditure). Total expenditure could usefully be broken down by broad input category (salary, transport, supplies, etc.) to draw attention to where most of the funds are being used. This should be on a sufficiently regular basis (probably monthly) to satisfy the contributing community members. Regular reporting of expenditure is likely to be crucial in

maintaining community confidence that funds are not being misspent and in encouraging continued support of the programme. It also serves as a useful way to keep track of the financial viability of the programme. If the allocated funds are all consistently being spent before another round of contributions are collected, collections might need to be increased or more frequent. A surplus of income over expenditure might signal accumulation of excess funds. The community will need to decide how to allocate these funds to other activities and to consider appropriate security arrangements.

Communities may also need to assess the capacity of their members to pay for health programmes. For example, a donor may present the community with a number of options having financial implications for the community. Determining the local financial implications and their feasibility is one of the basic steps in making the choice. In small communities, financial capacity may be ascertained by negotiation or decree. Otherwise, some rough measures (perhaps based on local indicator of wealth -- e.g., number of livestock or quality of house) could be employed. Attempts to assess income or available cash directly are unlikely to be successful, particularly if such studies are undertaken by outsiders.

Periodically, PHC and community leaders might wish to consider other strategies and compare their costs and outcomes with similar ongoing programmes to determine whether there are better approaches.

An unfortunately common situation is that communities have very little direct control over health services provided to them, even when they contribute financially towards these programmes (e.g., through taxes, fee for service or drugs, or insurance schemes). If this is the case, the responsibility lies with the providers to provide the community with some basic information concerning the way these contributions have been spent. In practice, however, the onus is on the community -- which rarely demands that these funds be accounted for.

> If community participation in primary health care is to be operationalized effectively, then information concerning resources available, resources used, and the results achieved must be made available to the community on a periodic basis, even if direct control over resources is withheld.

The process of transferring information from health services to the community, interpreting this information and responding to the community's reaction is a highly useful and productive exercise, promoting interaction between the health service and community. Furthermore, this information can usefully be prepared by health services for the community:

(1) **total annual cost of recurrent resources** invested in the health services per capita within the catchment area; this can be used (a) to indicate whether there are improvements over time, and (b) for equity comparisons between communities served by different facilities;

(2) **breakdown of costs by activity** to determine whether the community favours the existing programme emphasis;

(3) **the level of funds required to implement and sustain certain activities**;

(4) the likely costs, outputs, effects, and impacts of **various alternative uses of existing resources.**

Even if health service leaders are reluctant or unable to delegate financial responsibility to the community, there remains wide scope for involving communities in periodic decision-making about the allocation of available resources, e.g., how frequently to operate mobile clinics, when to hold prenatal sessions, whether to give more attention to home visits. In guiding communities in these choices, information needs to be provided about the benefits and costs of the alternative services.

Financial/Resource Information for Use at Peripheral Health Unit Level

Between district management and the community lie the local health service implementors, ranging from hospitals through health centres to community health workers unattached to a facility. These units represent different degrees of sophistication in terms of their capacity for generating information and in their level of control. Hospitals are often relatively autonomous. Health centres may receive small discretionary funds from the district but generally have very limited financial control. Even if they receive fees for service or payments for drugs, these funds frequently have to be remitted to higher levels. However, health centres usually have considerable control over the way financial resources are used. For example they can decide what staff should spend their time doing, how frequently transport is used and for

what purpose, which of the available drugs to prescribe, and so on.

To facilitate management of these resources, health centres could collect and analyse information which can serve as:

- a check on waste,
- a pointer to inefficient resource allocation,
- an indication of problems with supplies.

(1) **basic inventory records** on supplies, particularly drugs and vaccines; consumption should be calculated monthly as a guide to future need and an indication of how much longer present supplies will last.

(2) well-kept **vehicle log books** identifying mileage, petrol consumption and purpose of trip; future petrol requirements can be calculated.

(3) based on this and other information concerning resource use it is possible to do **periodic assessment of key inputs**:

- **percent of staff time** spent on key activities such as prenatal care, immunization, curative care, health education, etc. Does this allocation of time reflect stated priorities?
- **amount of drug dispensed** per relevant case diagnosed (for key drugs such as chloroquine). Compare this with the recommended dose per case. If it is much lower, does this mean misprescription or drugs running out? If too high, is it the result of over-prescription, theft, or wastage?
- **percent of vehicle trips** for direct service provision and supervision: Are vehicles being appropriately used? How many contacts are made (e.g., immunization house visits) per vehicle trip? Are these trips achieving enough? Could they be more effective if rescheduled?

(4) **income and expenditure:** Where health centres do receive fees either from the public or the district they need to account for these. Simple checks should be incorporated to discourage misappropriation. For example, there should be a weekly check to confirm that total fees for service correspond with numbers of attendees or that drug revenues = quantity of drug dispensed x set price.

Cost Analysis at District Level

There are two essential tasks of cost analysis at the district level. The first is to identify all the major sources of finance and the value of their contribution. If contributions provide different kinds of inputs, then a presentation such as Table 1 would be appropriate. If they provide for different activities or facilities, then a breakdown by activity or facility would be preferred.

The second essential set of cost data that should be used at district level is the **operating (or recurrent) costs of each health facility in the system** (Table 2). This data is relatively straight forward to collect and allows a substantial amount of simple cost analysis to be undertaken.

Once this basic information is collected it can be compiled and expanded. For example, information on costs of district level administration and hospital services can be added to give Table 3. The total district budget could be subdivided by inputs and compared with expenditure (Table 4). It might also be possible to estimate the costs of different activities within the district (Table 5).

This annual expenditure data should also be combined with measures of output so that performance at different health centres and over time can be monitored.

Although it is feasible to use a set of output measures (e.g., number vaccinated, number of attended births, number of education sessions, number of treatment contacts by broad symptom group, etc.), there are obvious analytical advantages in locating a single measure of health service output. The number of contacts fails to capture any sense of the major differences in significance (either in terms of community satisfaction or health impact) of different types of contact. Health measures which more satisfactorily capture this, such as mortality, are notoriously difficult to measure and interpret.

One possibility (although not adequately explored in the literature or the field), is the use of a locally developed **weighted index of output measures**. This could use existing activity records and, with weights developed by user and provider representatives, aggregate them into a single overall measure of PHC activity. Such a method is capable of reflecting community preferences regarding health actions on a very decentralized basis, and requires no additional service based data. It is capable of application in contexts where PHC is interpreted narrowly in selective child-survival focus,

Table 1. Cost Profile by Source

Inputs (or facilities or activities)	EXPENDITURE ($ AND % OF TOTAL) Ministries of Health	Other Govt. Depts.	Donors	Total	
RECURRENT					Which sources were over-spent? underspent?
Personnel					
Supplies					What percentage of total costs are provided by outside donors? How does this compare with previous years?
Vehicle Op.					
Equipment Op.					
Building Op.					
CAPITAL					
Vehicles					Which inputs are more dependant on donors?
Equipment					
Buildings					
TOTAL					

Table 2. Cost Profile by Health Centre Catchment Population

Inputs	EXPENDITURE ($ AND % OF TOTAL) Health Centre A	Health Centre B	Health Centre C	Total	
RECURRENT					If budgets are kept by health centre, which are overspent and which are underspent?
Personnel					
Supplies					Are there any health centres where the cost profiles are significantly different? What might account for this?
Vehicle Op.					
Equip. Op.					
Building Op.					
CAPITAL					
Vehicles					In which health centre is the cost per head lowest? What might account for this?
Equipment					
Buildings					
TOTAL					
POPULATION COVERED					
COST PER HEAD					How does total cost per head in this district compare with other districts?

Table 3. Cost Profile by Level of Service

	EXPENDITURE ($ AND % OF TOTAL)			
Inputs	**District Administration**	**Health Centres**	**Hospital**	Which levels are overspent and which are underspent? At which level are most of the costs incurred?
RECURRENT				
Personnel				
Supplies				
Vehicle Op.				
Equip. Op.				
Building Op.				
CAPITAL				
Vehicles				
Equipment				
Buildings				
TOTAL EXPENDITURE				
TOTAL BUDGET				

Table 4. Profile by Category of Input and Service Population

	EXPENDITURE ($ AND % OF TOTAL)			
Inputs	**Budget ($)**	**Expend ($)**	**Expend (% of total expend.)**	Did total expenditure keep within the budget? Compared with previous years, are budgets and expenditures better matched? Which inputs were overspent and which were underspent? What % of total expenditure was on capital? What are recurrent costs implications of this capital expenditure? In which inputs was expenditure greatest? (These should be focus for futher efficiency studies.)
RECURRENT				
Personnel				
Supplies				
Vehicle Op.				
Equip. Op.				
Building Op.				
CAPITAL				
Vehicles				
Equipment				
Buildings				
TOTAL EXPENDITURE				

Table 5. Cost Profile by Activity/Function

Inputs	EXPENDITURE ($ AND % OF TOTAL) Training	Management	Delivery	Evaluation	
RECURRENT					What functions are overspent? underspent?
Personnel					
Supplies					Which functions are most capital intensive (i.e., % on capital is high)?
Vehicle Op.					
Equip. Op.					
Building Op.					
CAPITAL					On which functions is expenditure highest?
Vehicles					
Equipment					
Buildings					
TOTAL EXPENDITURE					
TOTAL BUDGET					

or more broadly along the lines of the essential elements enumerated at Alma Ata.

For those activities of the programme which are reasonably distinct, it may be possible to measure separately their costs and outputs to decide whether a shift of emphasis is appropriate. This data (e.g., cost per case treated, cost per family planning acceptor, cost per well dug) should be complemented with some data on coverage to aid community decision-making.

IMPLEMENTING FINANCIAL COMPONENTS IN PHC MIS

Greater local discretion regarding the raising and spending of money is necessary. Experiences in community-based PHC in many countries have shown that **fee collection, on an item-for-service basis or by various terms of prepayment, can provide a substantial proportion of the total operating costs of community-based PHC** (Stinson). **Furthermore, it has been possible to conduct the financial, logistic, administrative and health care delivery functions of community-level actions in a fully integrated fashion**, as Thailand's experience has shown.

The evolution of successful management methods in community-based PHC has not occurred without failures and setbacks. Many projects have collapsed as soon as donor support was withdrawn. Others have had very little support and, consequently, little impact. Too many have been over-directed instead of supported. There has, in the course of the last decade, been much innovation and experimentation, and some learning.

In government health service systems there has, by contrast, been a more uniform picture of divided responsibilities and inflexible response, at a time of often rapid decline in the real per capita spending power of PHC services. Experimentation with new forms of management has not been common and, indeed, is not easy to initiate in the context of established programmes.

Greater devolution of financial autonomy in government health services will create a changed management environment and may, if well implemented, do much to promote more efficient management. With devolution, changes in reporting and data flow systems are necessary. The respective roles of headquarters and regional/district levels will change. In resource and financing functions, headquarters should take a greater role in ensuring that consistent resource allocation criteria are employed in determining

district entitlements. The existing system of "last year's plus or minus x%" all round has perpetuated geographical inequity. Simple population-based budget targets, entailing differential growth (or contraction) rates, should be promoted by Ministry headquarters. Major resource allocation policy decisions would, thus, remain the responsibility of ministries, but the translation of local budgets into service provision decisions would be increasingly decentralized.

WHO's district level programme entails a network of collaborating districts designed to introduce, assess and, where successful, replicate change. The district is a convenient management unit for modest experimentation. The workshop has acknowledged the potential role of the microcomputer in district management and made the distinction between routine analysis and special studies. A careful consideration of the likely benefits and costs of microcomputers needs to be made. New technologies are emerging and countries are at varying levels of readiness to take advantage of this. There is some pressure to adopt microcomputers without a thorough analysis of economic consequences. The relative efficiency of alternative information technologies is significantly understudied. The obvious benefits (ease of routine data collection, potential for more sophisticated analysis, quicker turnabout and feedback of data, more convincing presentation) and the less obvious benefits (microcomputers as an attractive entry point for training to encourage new approaches) need to be set against their costs in both hardware and training.

The types of report and analysis outlined above can readily be conducted by using such standard spreadsheets as Lotus 1-2-3. Although payroll information is generally computerized on mainframe or microcomputers, it is not usually in a sufficiently disaggregated form, nor is it a complete enough inventory of expenditures, to merit down-loading to district-level microcomputers for cost analysis purposes. Instead cost profiles for individual health units, sub district, etc. should be built up from the latest available actual expenditure records using the formats proposed earlier.

CONCLUSION: IDEAS, ISSUES, AND PROBLEMS

Problems with existing financial data lie in its inappropriateness for management purposes. A management system is required which increases focus on the **performance** of individual health providers and of health care institutions. **Work is needed to develop and test possible indicators of resource allocation to supplement financial records.** Typical routine financial components of an MIS do not signal waste and inefficiency in resource allocation. **Information systems have to be set up in such a way that responsibility for performance can be clearly established.** There seems to be no likely change in this situation until professional accountability of service providers and finance personnel are brought more closely together.

The basis of reliable cost analysis and tracking the efficiency of PHC is by accurate and properly kept records on costs and their allocation by the variables of analysis. (Photo by Jean-Luc Ray, AKF)

Reporting purposes to which financial and resource allocation information can contribute are broader than the usual ones of accounting and control. Making better use of resources also implies increased efficiency in the allocation and utilization of resources and effective means of cost containment. **To reduce waste, underutilization and misuse of resources, accountability must be improved.** Desirable management activities could include **performance and equity review** (e.g., by comparisons of unit costs and per capita availability of PHC resource) and the **projection of future requirements** and **appraisal of their sustainability**. **Advocacy** -- to defend the district's share of resources by monitoring trends and patterns of spending -- also has a role.

Cost apportionment among PHC actions needs special studies. A composite measure of PHC activity, aggregating different service outputs on a weighted basis, would allow cost and performance comparisons to be conducted routinely. Weights could be devised on A delphi-type basis including PHC providers and community representatives.

MAJOR RECOMMENDATIONS

The major recommendations of this technical working group were as follows:

(1) **The operating costs of each health unit in a district should be estimated annually.** This would allow (a) aggregation to the total district, (b) disaggregation into input types, per capita and per contact costs, and (c) examination of unit cost variations among levels and facilities.

(2) This financial information should be supplemented by **more regular collection of a limited set of data on resources** (e.g., staff time by activity) to be used **for monitoring quality and efficiency**.

(3) **Communities should be assisted in maintaining records of their financial transactions for PHC, and in estimating the cost implications of potential developments.**

(4) There should be a **major shift in emphasis from the use of financial information solely for accounting purposes to the use of this information for (a) accurate estimation of future costs (b) judgments about efficiency, and (c) in advocacy**.

(5) **All management training offered should include material on essential financial and economic concepts and tools.**

(6) **The conceptual and practical feasibility of aggregate measures of PHC activity should be explored.**

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In India, a community health worker uses an open-ended group interview to identify community needs and to develop a plan of action.

Microcomputers and Alternative Data Management Techniques

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OVERVIEW

The conventional approach in primary health care (PHC) has been an encounter-based record system with the community health worker (CHW) or other PHC worker serving as the entry point for most data collection. For a variety of reasons, this method often has not provided appropriate information for efficient management of PHC systems. Thus, the working group on microcomputers and alternative data management techniques was given the task of exploring alternatives to record-based systems. The report that follows discusses information generation; the relevance of new methods based on the microcomputer to facilitate timely collection and analysis of data for management decision-making; criteria for software and hardware selection appropriate to these alternative methods; and training requirements. Conclusions that emerged from these deliberations are presented, as are recommendations for their timely implementation.

INFORMATION GENERATION

The primary health care panorama is diverse and complex. Major differences are observable between urban and rural programmes in the same cultural and economic setting as well as among countries or regions with different levels of development or cultural heritages; no single information system will support this diversity of information generation and management needs.

An information audit should be conducted to identify user requirements.

The information audit is a managerial tool for the examination of information used to make decisions. The audit is designed for use where a current service delivery system is in place and collecting information. The information identified as relevant to current decision-making and to what might be used in some future system is then ordered by priorities according to the resources allocated on the basis of the decisions being made. At the end of the information audit the basic elements needed to make decisions, and their relative priorities, should be established.

The major steps of an information audit are as follows:

(1) **Determine the levels of information generation and use in the system.** These levels would include at the minimum the CHW, CHW supervisor, managers at the health centre and district-wide, regional and/or national levels.

(2) **Determine the basic information needed to carry out tasks at each level of the system.** This is usually an interview process whereby workers are sampled and queried as to what information they collect as well as what information is actually used. This exercise is carried out at each level identified in step one.

(3) **Determine the degree of validation needed and the specificity of the measurement.** This procedure is used to examine each data item with respect to the urgency of the decision made and the requirements of the measurement. For example, if a critically malnourished child is identified, this needs to be addressed in a different way than does a routine piece of census information. Likewise, epidemic infectious disease data needs to be reported quickly whereas routine morbidity information required for some decisions may not.

(4) **Determine the degree of match between system decision needs and the information collected**. In most cases there will be more information collected than is or could be used.

(5) **Examine results of this match with reference to the quality of data being collected.** This is of particular concern in decision areas where resource allocations and/or fast turnaround responses are crucial.

(6) **Evaluate training needs to improve quality of data collected at all levels.** Inadequate information does not always mean collecting more information. On the contrary, it is estimated that well designed and targeted systems can significantly reduce data related tasks, thus freeing the PHC worker for more appropriate health delivery activities.

(7) **If present system is unacceptable or new technology is being introduced, design new system** in draft form with an emphasis on information needs. Any new system design should take into consideration the frequency and urgency of the decisions supported by the information, as well as performance and development time trade-offs.

(8) *Develop pieces of the new system and test in the field*. Field testing is required to evaluate impact on cost and performance.

No information system should be developed without a careful assessment of the levels of information generation and use, the resources allocated by the decisions made, and some element of the potential impact of those decisions.

The following example details an information audit plan.

SWEDEN

The Department of Medical Informatics at the University of Linköping is undertaking a study to see "if" and "how" information technology can help in the delivery and management of PHC in developing countries. The purpose of the survey is the construct of a factual base for planning the development of an "integrated computer system to meet the composite needs of the PHC physician." The study will seek participation of health authorities from several developing countries to:

- assess the work, work environment, and work need of PHC physicians;
- analyse decision support and information resources;
- evaluate the source and extent of "common global knowledge";
- assess primary care centre administrative data needs;
- assess available technical support services.

INFORMATION AUDIT OF A HYPOTHETICAL PHC SYSTEM

To provide a common focus for deliberations, the working group agreed upon an operational definition of primary health care and then outlined a hypothetical PHC system. This model was based on members' actual project experience. In keeping with the principles of an information audit, the working group then analysed the levels of information generation and utilization in the model. At the end of this process, the question posed was, "What is the appropriate data management technique at each level, and is the microcomputer

an appropriate technology to use with that technique?"

Five generalizations resulted from this exercise:

(1) **At the field contact level, census data is seen as a basic need.** In the Kisumu project, an annual household count augments a 10-year census, whereas in Dhaka the Aga Khan Community Health Programme (AKCHP) first registers all households and then updates the information on a quarterly basis. In both cases, the information is stored on the microcomputer; this has resulted in both a decreased error rate and the ability to use the data more efficiently.

(2) **With the exception of the census, the microcomputer is not seen as an appropriate routine tool for the PHC worker or supervisor at the present time.** Members of the group cautioned, however, that technological advances may call this decision into question in the not-too-distant future.

(3) **If analysis of census data is to be assisted by a microcomputer, consideration should be given to entering the household records into the database.** Entry of household data should be limited to key demographic parameters, however, with subfiles created for other elements of importance. It was felt that PHC workers require this data for their activities, and that microcomputerization facilitates its utilization with limited additional effort or cost.

(4) **It is at the district level that the power of the microcomputer and its special study tools can best be utilized.**

(5) **At the regional, national, and even international level, the types of special studies do not differ greatly in subject matter but rather in their consequent management and political implications.**

ALTERNATIVE DATA MANAGEMENT TECHNIQUES

There are two general approaches to the processing and analysis of PHC data: the intensive **record-based** model where the PHC worker serves as the entry point for most data collection, and the **special studies** approach. The record-based model has the advantage of record and data source linking, while the special studies approach affords an opportunity for a rapid response to information needs. There is no magic formula for choosing between or for combining approaches.

Choice of data collection and management technique(s) requires informed decision-making. Consideration must be given to whether the system is a new development or an add-on to a previous system, the availability of resources, their cost, and possible impact.

"Alternative" is perhaps not the word of choice when discussing data management techniques. "Alternative" suggests an either-or situation, whereas data collection and management may involve multiple approaches. The utilization of special studies does not preclude entry of the data into a routinely maintained database. The collection and recording of census data in the AKCHP is a case in point.

Bangladesh

The AKCHP is an urban PHC project in Dhaka, Bangladesh emphasizing integrated maternal and child health services. It has a target population of 67,000 individuals and utilizes a record-based management information system. Almost all of the information needed by programme management is collected on a regular basis by the community health worker (CHW). As a result of this effort, approximately 50% of the CHW's time is spent collecting data and filling out forms. In the next few months, AKCHP management will conduct an information audit with an eye toward reduction of routine data collection and recording. While they envision retention of a pared-down record-based system for management of certain project activities, they foresee supplementing the database with special surveys if and when desired.

The amount of time spent in data collection reported by the AKCHP is not surprising. A number of recent studies by the World Health Organization (WHO) and others have found that an average of 40% of the working time of primary health care workers is spent filling out forms and collecting data (Figure 1). Yet, it is estimated that

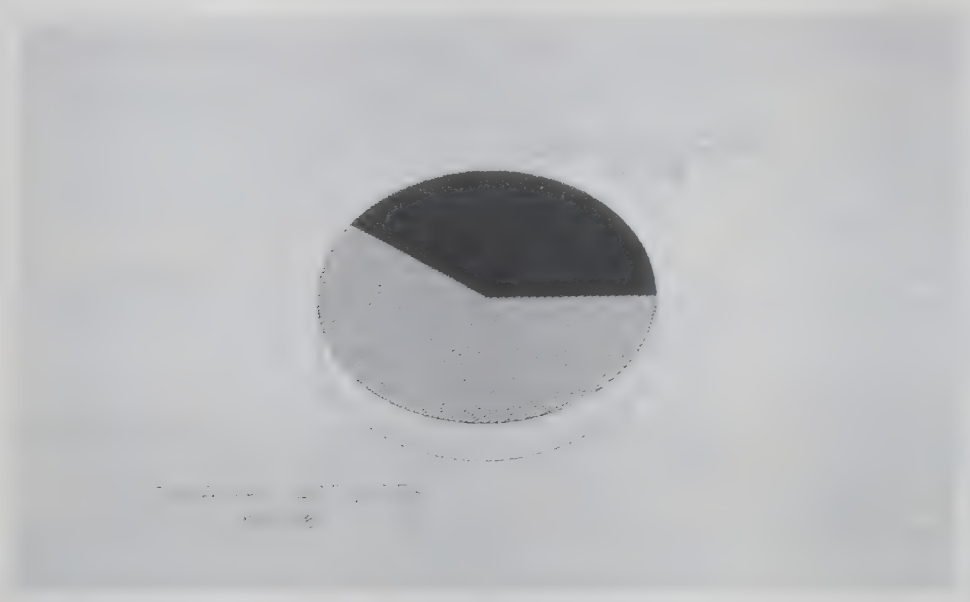

Figure 1. Proportion of PHC Worker Time Spent Collecting Information (WHO/Tulane Studies, 1986-87)

a well-designed and targeted data collection system can result in a 40 to 50% reduction in data related tasks, thus liberating up to 20% of the PHC worker's time for more appropriate activities.

Special Studies

There are a number of special study techniques; these include information audits, surveys and censuses, surveillance, Delphi techniques, expert informants, and focus groups. Although the choice of technique will depend on the problem and resources at hand, special studies share some characteristics:

- not done routinely;
- commonly conducted in response to a problem signaled by the management process;
- do not require additional data collection at the primary health worker level;
- often use methods derived from sample surveys and related technical areas;
- there is an urgent need for the results.

There are many situations wherein special studies offer the manager an effective tool for rapid response to decision-making information needs. Some of these areas include:

- special disease outbreaks;
- food shortages or nutritional emergencies;
- manpower distribution surveys;
- changes in knowledge, attitudes, and practices;
- inventory validity checks;
- special investigations of high risk health problems;
- vulnerability analysis;
- equipment maintenance status;
- verification of utility of indicators.

The following examples suggest the diversity of needs that can be addressed.

Haiti

With personnel expenditures representing over 80% of the Ministry of Public Health's operational cost, it was obvious that efficient management in this area was a major strategy for cost reduction. No unified list of personnel existed and individual files, where they existed at all, were not up to date. There was little adherence to established rules for control of personnel movements and transfers, with considerable duplication resulting in a number of checks printed for a single individual. Because the payroll came directly from the Central Ministry of Finance, with checks grouped by administrative unit or health establishment, such duplications could not be identified.

After numerous unsuccessful attempts at hand sorted personnel lists, a computer file was created through entry of a single month's payroll as received in the Department of Health for the Ministry of Finance. The master list was sorted alphabetically by name, making it possible to identify duplicate checks. The duplicates eliminated saved enough money in one month to pay for the entire cost of the computer's hardware, software, and its operational personnel for more than ten years.

Bangladesh

In the last few months, there has been a substantial drop in the number of patient visits per clinic day in one of the satellite clinics of the AKCHP. Management feels that the reason for this drop may be that cases of skin diseases and other easily preventable diseases have decreased. A survey will be carried out in the project area that surrounds the satellite clinic to test this hypothesis.

Pakistan

Several months ago, Orangi -- one of five Aga Khan University PHC field sites -- faced a major disaster: an outbreak of ethnic clashes that resulted in 160 deaths and 550 serious injuries. An interview study was conducted to assess household adjustment after peace was reinstated.

In another kachi abadi, use of family planning methods was very low despite CHW efforts to motivate the community. A household sample was undertaken to evaluate knowledge and practices within the community.

Kenya

Early this year the CHWs in Kisumu noticed that many children in the area were losing weight, getting fever, were being taken to the hospital for blood transfusion, and then dying with anemia. The CHWs were concerned about these frequent deaths and called them to the attention of the community health nurses. A special study is now underway to establish the prevalence and, hopefully, the cause of the anemia.

SOFTWARE SELECTION CRITERIA

Of all the special study examples considered by the working group, the only non-standardized data protocol which might require special manipulation is that of nutritional status. Special anthropometric forms of analysis are called for here. Otherwise, the vast majority of applications can be handled using standard software; caution should be exercised in software selection, however, as the following example demonstrates.

Uganda

The Ministry of Health decided to undertake a manpower inventory. Insufficient consideration was given to determining software requirements and, as a result, the computers purchased used a unique operating system. Software compatible with the operating system proved to have serious limitations. The computers were replaced with IBM-compatible models and the inventory was transfered to more appropriate software; this required extensive programming to accomodate the change in operating systems.

The following selection criteria are all seen as desirable when not outweighed by the cost of their inclusion.

General

Software selection calls for balancing cost against a variety of capabilities both specific and generic. In general, software should:

- be CPU efficient -- i.e., when two programmes have the same performance characteristics but different memory requirements, the programme using the least memory space is usually preferred; programmes which use close to the limit of the microcomputer's memory sometimes are difficult to execute on different machines;
- be compatible with a variety of computer brands and models;
- not limit user's ability to make backup copies;
- be available in user's national language;
- include documentation that facilitates utilization;
- provide correct results and documentation of same when computation is performed;
- in the case of database managers, allow for compiling;
- be cost effective;
- not be used in an experience vacuum -- i.e., if a large user group exists for a given piece of software, it may be wise to use that software in order to have ready assistance in solving technical problems; this is true even

if other software is slightly superior in performance.

Data Entry

Software should facilitate data entry in a variety of formats and file size. Error trapping by techniques such as consistency and logic checks is also encouraged. Software should provide for:

- multiple fields, data types, and records;
- user defined record format;
- full screen and selective field display and data entry;
- data manipulation;
- dependent field entry;
- verification of data range;
- consistency and logic checks;
- individual and universal field/record updating;
- linked file appending;
- automatic file backup.

Data Management

Software should allow data of varying type and file location to be searched, compared, and processed. Software should permit:

- basic file management;
- large number of fields and file size;
- multiple file linkages and table look up;
- string searches;
- manipulation/comparison of varying field types;
- data indexing and sorting;
- manipulation of field placement, definition, and inclusiveness;
- command file batch processing;
- file import/export.

Data Analysis

A variety of techniques are required for data analysis. The software should facilitate choice, understanding, and use of techniques. Software should provide for:

- descriptive statistics;
- regression, logistic regression, correlation, and scaling;
- time series, analysis of variance;
- random number generation and sampling;
- sampling and study design prompts;
- formula definition.

Graphics

Graphic displays are useful for data presentation and interpretation. Software should:

- generate graphics;
- allow data to be displayed in histograms, pie, stacked bar, x-y, cluster, or mapping format;
- permit integration of graphics and text;
- allow flexible design;
- provide for sharp colour and density definition.

Report Generation

Software needs to accommodate a variety of report formats. Software should:

- include document design capabilities;
- permit character type translations;
- support multiple printers and fonts.

COMMERCIALLY AVAILABLE SOFTWARE

Software which address the concerns listed above fall into six general categories: specialized data entry packages, database managers, spreadsheets, statistical packages, graphics/report generators, and word processors. Commercially available software which fall into these categories and with which workshop members have had experience are discussed below.

Specialized Data Entry Packages

As their name implies, this category of software is almost totally limited to data entry capabilities. Despite this seeming limitation, these packages are definitely recommended for special study applications.

DataPoint

- high quality but expensive
- no specialized health routines

SurveyMate

- still somewhat in development stage
- low cost
- some instruction materials available

I.Q.

- powerful new package particularly adapted to health applications
- includes powerful edits and anthropometric conversions

EPI Info

- "freeware" programme distributed by CDC with basic data entry and analysis capabilities

CDCAnthro

- specialized CDC package for nutritional surveillance and anthropometric work

Database Managers

One of the most powerful and useful family of programmes for the PHC manager; nonetheless, they have their limitations. Programming for multiple entry edits and checks or for statistical analysis beyond totals, means, or percentages can be difficult and costly. Latest programme versions can be expected to include functional report generators and some flexibility as to printers and fonts, but only minimal graphics.

dBase III Plus

- powerful but relatively expensive relational database system
- offers an above-average repertoire of programming commands and mathematical and string functions
- excellent third party support

KnowledgeMan 2

- similar to dBase in price and capabilities

Foxbase Plus

- less-expensive dBase clone
- surpasses dBase in speed and ability to handle multiple relations between data files
- not easy to use
- not 100% compatible

DBXL

- another dBase clone
- less expensive and easier to use than Foxbase
- requires an enormous amount of memory

Paradox

- a medium-priced, increasingly popular, easy to use package

Spreadsheets

Less powerful than database managers or specialized entry packages, but still useful for small, straightforward data entry needs. Spreadsheets are often used for routine small database manipulation but are not recommended for that function. They have the potential for powerful statistical manipulation, but most have to be user-programmed. Graphics range from good to superior. Most packages allow report generation through graphics and text output.

Lotus 1-2-3

- version 3.0 is expected to address most of the deficiencies in this popular and well-supported software

Supercalc 4

- costs about the same as Lotus
- offers a few extras such as a copy of Sideways (a utility programme that allows wide files to be printed at a 90% rotation) and the ability to preview graphics regardless of monitor type

Quattro

- a newly released spreadsheet which is expected to give Lotus stiff competition

Microsoft Excel

- feature for feature, better than Lotus 1-2-3, but requires an AT or 386-based PC, 640K RAM, hard disk, color/graphics monitor, and DOS 3.0 or higher.

Statistical Packages

Most statistical packages have some form of direct data entry possibility. Though few have database functions, some allow considerable data manipulation. Major packages have excellent graphics capability but, in general, this software is weak in report generation.

SPSS/PC+

- basic statistical package can be enhanced with other SPSS packages such as

Advanced Statistics, Tables, Graphics, and Data Entry

Gauss

- both a new programming language and an evolving statistical package emphasizing econometric procedures and maximum likelihood estimators

Graphics/Report Generators

Specialized software category with ability to produce and/or integrate graphics and text; not intended for data entry, management or analysis.

Harvard Graphics

- excellent product at a moderate price
- wide range of graphics capabilities
- compatible with other programmes

VP Graphics

- inexpensive
- good choice for the occasional user

Ventura Desktop Publishing

- professional page layout system which combines text and graphics generated from a variety of software programmes
- requires lot of machine and printer memory for full utilization of capabilities
- expensive and complicated, but gives high-quality, attractive document results

Word Processors

Definitely not appropriate for data entry and, though they can handle global searches, should not be used for database activities. Capable of simple counts but otherwise have no statistical abilities. Most allow report generation by importing data from other programmes; some can integrate graphics.

WordPerfect

- the number one best seller
- user-friendly

WordStar

- the original Wang "act-alike" has expanded its previously inadequate dictionary and simplified some of its commands

MultiMate

- impressive dictionary and thesaurus
- plus many professional abilities

Microsoft Word

- the number two seller
- style sheets and font access work well with laser printers

HARDWARE SELECTION CRITERIA

With rapidly changing technology always an issue, cost and performance should be a major concern. The following criteria are suggested for the minimal hardware configuration needed to perform the tasks identified in the execution of special studies.

General

Hardware should:

- be IBM/XT compatible;
- permit modular replacement at the local level.

A supply of key spare parts should be purchased with the machine.

Specific

Hardware should include:

- 640K RAM;
- 2 floppy and 1 20MB hard disk drives;
- graphics adapter;
- monochrome display;
- rs232 or serial communications port;
- system to transfer data between varying disk drives;
- backup system;
- wide-carriage dot-matrix printer with graphics capabilities;
- uninterrupted power supply;
- redundant hardware supplies/spare parts.

Operating Environment

While hardware should always be operated in a cool, dry and dust-free environment to the extent possible, it should be noted that equipment has often been used successfully in extremes of dust, heat, and cold. This would suggest that most

manufacturers lean toward conservative estimates of operating tolerances.

New portable microcomputer units are especially well suited for special study applications as they have battery power sources built in, and usually come bundled with all of the required options listed above. The option for solar power of these units is also available.

TRAINING REQUIREMENTS

Operators should be trained in maintenance at the board and unit replacement level.

Training:

- materials should be available;
- should not be limited to one operator;
- should be aimed at users;
- should be available on-site;
- should include problem-solving and hardware maintenance;
- should be an integral part of the overall system.

BASIC REQUIREMENTS FOR INFORMATION USE

The accuracy of information is a necessary but not sufficient condition for use, especially in developing countries. In order for most technical and logistical information to be employed in the execution of a project, it must be timely as well as accurate in content.

Information which is critical to project execution is time-dependent.

This means that the same information, if delivered after a certain time, has lost much -- if not all -- of its value. This is frequently due to the intrinsic value of the information itself ("The vaccine is arriving on flight 123 on Thursday"). Even more important is the potential loss of human and material resources that may be pressed into alternative service if not utilized based on a critical need to know.

From the standpoint of planners, projects are sometimes viewed as objectives compartmentalized into specific activities, all having discrete beginning and ending points. From the perspective of the field staff, however, it is often more realistic to consider accomplished objectives as having successfully recognized and exploited "windows of opportunity." When the "window" is "open," it is critical to have the right information available at that time. When the window is "closed," (e.g., field staff have promised skeptical village leaders information on a new treatment for cholera but have not delivered same), it may be twice as hard if not impossible to reactivate interest.

Most useful information is the result of multiple pairs of query- response, each response providing more input to an ever-refined query. This makes the reduction of turnaround time important and suggests that communications modes that specifically address reliability and speed, particularly from isolated areas, will become enormously significant for rural-based health care projects. Volunteers in Technical Assistance (VITA) is addressing this issue through its PACSAT project.

VITA

As information providers-on-demand for more than a quarter century, VITA has had much experience in trying to make information more useful to projects by both supplying accurate technical information, and by filling requests as quickly as possible through appropriate combinations of volunteer expertise and documentation. Until recently, not much could be done about the vagaries of international mail. Now, however, the PACSAT project, which allows for reliable digital information transfer from a low earth-orbiting satellite to extremely low cost ground stations anywhere in the world, begins to address that challenge.

TECHNOLOGY: TODAY/TOMORROW

It was not long ago that the "feasibility" of using microcomputers was in doubt; it was feared that erratic power supplies, humidity, heat, and dust would preclude their use. Fortunately, technology proved equal to the challenge and microcomputers were introduced into the PHC environment. **Today, the issue is no longer one of feasibility but one of appropriate utilization: how can the microcomputer best serve the needs of management?** Table 1 lists changes that might be expected after the introduction of microcomputer technology.

Table 1. Indicators of Effects of Microcomputer-Based Management Information Systems

Short-Term Tangible Effects		
Amount of time saved in processing routinely collected information.	Amount of time saved in processing special studies.	Increase in number of requests for information from data sources.
Increase in number of requests for information from data sources.	Increase in level of support due to the ability to present well organized and up-to-date information (e.g., budget increase).	Increase in use of equipment (microcomputers) needed to analyse and process data.

Short-Term Less Tangible Effects		
Increase in morale due to ability to present more and better information in order to defend a position.	Increase in status of information unit within organization.	Higher standards in presentation of information in group meetings.
	Improved and more professional image of organization by peer and control organizations.	

Long-Term Tangible Effects		
Movement of information production unit to a position directly under the control of	high-level decision makers in the organization.	Absolute decrease in amount of time spent in information collection and management at service levels.
Improvement in programme impact measures due to greater resources being dedicated to service activity.		Decrease in control structure size due to increased information flow and the need for fewer managers.

Long-Term Less Tangible Effects		
Improved morale due to improved productivity of entire system with resultant higher levels of feedback and potential for higher job satisfaction.	With more information each worker is able to exert greater control over his own environment, making more intelligent decisions and ultimately reinforcing more flexible and democratic organizations.	With more accurate information in the system lower level workers may begin to be a source of suggestions for improvements in the functioning of the system.

Source: Bertrand, W. E.; Arminana, R.; and Bertran, A. I.: *Management Information and Microcomputers in the Health and Social Service Sectors of Developing Countries*. Lynne Riener Publishers, (in press).

The use of microcomputers in PHC is not tomorrow's technology; the case studies cited bear witness to that. Microcomputer technology has been successfully used in numerous PHC/management information system applications.

The microcomputer is an appropriate technology for improving management information in PHC.

An important potential role for the microcomputer is in its use as an educational tool.

THE NEXT STEPS: CONCLUSIONS AND RECOMMENDATIONS

The nature of new information technology (rapidly changing, time bound) requires that assistance be made available to potential users.

There is a need for technical resource persons/groups who will track, test, and recommend hardware and software for PHC applications.

Training resources need to be identified and coordinated.

It is recommended that:

(1) **A coordinating committee**, based initially in the Aga Khan system, **be named which could fulfill the functions forming a network** for the purposes of:

- sharing emerging information and experiences;
- collaborating in developing new initiatives;
- advocating and supporting new developments;
- developing training programmes.

(2) **A subcommittee be established with the express objective of identifying resources for the implementation of an international network.**

(3) **Regional centres be established for training, dissemination, and testing related to management information system development.**

(4) **VITA be encouraged to establish documentation and distribution capabilities in support of the regional centres.**

A community health worker from the Aga Khan Community Health Programme in Dhaka, Bangladesh, updates household data. Entry of census information into the microcomputer has resulted in both a decreased error rate and an ability to use the data more efficiently. (Photo by Jean-Luc Ray, AKF)

Workshop on MIS and Microcomputers in PHC: Arif Rawji (AKU) describes a PHC simulation software programme, as (left to right) Azam Ali (AKCHP), Steve Rasmussen (AKHSP), Hugh Annett (Liverpool SHTM), Rosa Maria Costa Pecas (Portugal), Trygve Myhre (sitting at computer), John Bryant (AKU), Jack Reynolds (PRICOR) and others listen attentively. (Photo by AKF, Portugal)

Microcomputers in Primary Health Care Planning and Management Decision Modeling

Alexandre Abrantes and Adelaide Oliveira
National School of Public Health, Portugal
Trygve Myhre

INTRODUCTION

DESIGN SUPPORT AT THE LOCAL LEVEL

- SCHEDULING CARE
- PROVIDING CARE

DECISION SUPPORT AT THE DISTRICT LEVEL

- FORECAST POPULATION AND HEALTH TRENDS
- PRIORITIZE HEALTH PROBLEMS
- CONSIDER OPTIONS AND CHOOSE SOLUTIONS
- PLAN AND PROGRAMME ACTIVITIES
- MONITOR PROGRESS

CONCLUSIONS AND RECOMMENDATIONS

- HARDWARE
- SOFTWARE
- TRAINING
- TECHINCAL SUPPORT

INTRODUCTION

Management information systems, by definition, are expected to support management decision-making -- but most do not. Microcomputers and decision support software could help change this.

For years, business and industry have had access to software programmes which facilitate planning and analysis. These same tools can be useful in primary health care (PHC). Commercially available software utilizes techniques such as simulation, optimization, sensitivity analysis, forecasting, projection, "what if" models, linear programming, and project management, scheduling and resource allocation. Though few of these packages are PHC-specific, they do offer assistance in problem definition and resolution "weighting" -- thus helping the manager to frame the problem at hand and to choose amongst competing alternative solutions. A detailed example of this approach is the Microcomputer Simulation of PHC developed by The Aga Khan University, Karachi, Pakistan. This model is discussed later in the chapter.

DECISION SUPPORT AT THE LOCAL LEVEL

At the local PHC level, community health workers, health visitors, nurses and physicians are called upon to schedule and provide care for those in need. Microcomputers and decision support software can assist in this task.

Scheduling Care

A major concern of PHC programme management is coverage of target populations and high risk groups -- e.g., malnourished children; monitoring is essential. Database managers can simplify the identification and scheduling of individual services, thus freeing health workers to focus on the provision of those services.

Providing Care

A variety of software is available to assist providers of care. Programmes range from simple "what to do when there is no doctor", aimed at auxiliary health personnel, to complicated "expert" systems for use in diagnosis and treatment.

For example, *Eye Care*, a program developed under the sponsorship of PAHO, is directed at decision-making concerning eye ailments in the absence of physician availability, whereas *Internist* assists the physician faced with a certain set of diagnostic findings.

DECISION SUPPORT AT THE DISTRICT LEVEL

At the district or project level, decision-makers are concerned not only with target populations and high risk group indicators, but also with broad considerations of resource identification and allocation.

> Managers need to forecast population and health trends as a basis for operational decisions and for planning the best use of scarce resources. They must set goals, define tasks, set standards, allocate resources, and then analyse performance impacts. Fortunately, there are a number of microcomputer applications available to assist the manager at this level.

Forecast Population And Health Trends

Population and health problem projections -- e.g., estimations of the number of children under age two years of age five to ten years from now and the need for certain services that this figure implies -- are essential for long-term planning of resources. There are several software programmes that are useful for such forecasts.

DEMPROJ

The Demographic Project Program, which uses the life-table model, is specifically designed for population forecasting. It is easy to operate, and projections are readily interpretable. The documentation is not overly long or complicated. The programme has high data input demands if specific estimates are required, but can operate with limited and less precise data if the decision-maker is willing to accept regional values as defaults for the computation of forecasts. The programme is a very useful central planning tool.

Forecast Pro

This forecasting programme is based on time-series data. It is not specific for population projections as is Demproj, but rather is a powerful and flexible tool that can accommodate seasonal variation in the forecasting of expenditures, health indicator trends, and service utilization patterns over time. Menus and expert-system features make the software easy to use; in the absence of specific instructions, the programme will choose the optimal modeling method. Interpretation of the detailed results is somewhat difficult, however. Data input requirements are high; numerous observations are required for each variable over the years, months, weeks involved in the time-series. This is a useful tool which can be used without much difficulty, though the interpretation of results is somewhat complex.

Prioritize Health Problems

> Identifying a population and its health problems is only a first step; the manager must then decide which problems deserve precedence and/or focused resources.

Best Choice

In this programme, large and complex decision or evaluation problems are divided into a series of paired comparisons. The decision-maker then indicates a preference between the alternatives for each pair. These preferences can be combined to arrive at an overall problem "score", or they can be "weighted" as a means of assigning varying degrees of importance to the variables. In addition, the judgments of several decision-makers can be combined to arrive at a composite score. The programme is easy to use.

Consider Options And Choose Solutions

> Once the project manager has a sense of which problems need attention, decisions concerning interventions and resources are called for. There are computer applications which address this specific issue as well as general utilities that can assist these functions.

* * * * *

*A Microcomputer Simulation of PHC -- Applications in Planning and Teaching**

**The following section contributed by Arif J. Rawji, A.B.; John H. Bryant, M.D.; and Trygve Myhre, B.Mgt.E., M.Met.E.*

A difficulty in the planning and management of primary health care systems involves the multiplicity of choices about health problems, resource allocations, alternative health service arrangements and impacts on communities. To explore different possibilities, in quantitative terms, laborious calculation and recalculation are inevitable. With the aid of computers, however, the time and effort required to perform such analyses can be dramatically reduced. Computer-based simulations can be used to quickly examine key decisions and cause and effect relationships, and to ask "what-if" questions about alternative approaches to resource allocation. Simulations have their limitations, however -- they oversimplify the variables of the real world, incorporate biases of the designer, and tend to use linear functions for processes that are more often non-linear. Nonetheless, they allow explorations of a variety of approaches to defining problems, designing solutions and addressing outcomes that would be difficult to find and cope with in field situations. They can also be adapted to real-world settings and used to facilitate description, analysis and planning in relation to those settings.

A simulation of primary health care has been developed at the Aga Khan University, Karachi, for use in teaching and planning related to PHC systems. A template was first created on a Hewlett Packard 110 portable computer using Lotus 1-2-3 spreadsheet software (Bryant and Myhre, 1985). A subsequent version was created with refinements for use with Lotus Symphony (version 1.0) software, and a program of menus was added to enable systematic access to various parts of the spreadsheet (Bryant and Rawji, 1986).

The simulation provides projections of health service impact on a defined population. Outcome projections are arrived at using population and health intervention data furnished by the user, together with an internally defined model which has data sets similar to those described in Figure 1. Figure 1 is a schema of the types of data sets and their relationships in the simulation: health intervention data consist of manpower profiles and their deployment for specific health and functional infrastructure activities; these interventions affect the population's health status by addressing their health problems.

Table 1 illustrates baseline demographic data for the simulation model -- the age structure and male/female ratios being typical of rural populations in developing countries. Demographic characteristics of the simulated population are assumed to be identical (in terms of proportions) except for the population size which is defined by the user. Similarly, socio-economic status, described by indicators such as adult literacy rate, proportion of the population below absolute poverty and health expenditure per capita, is assumed to be closely similar in model and simulated populations.

Health and related problems for the model population are indicated in Table 2. In the area of nutrition, for example, 88% of all under five year olds suffer from protein energy malnutrition (PEM) of one degree or another; as for communicable diseases, the annual incidence among the population of respiratory tract infections is 40% while that of malaria is 28%. For the simulated population, the magnitude of these and other health problems are defined by the user.

Related to health problems is health status. Indicators of health status are listed in Table 3 depicting the model population. For the simulated population, baseline values for the infant mortality rate (IMR), 1-4 year old mortality rate (MR), maternal mortality rate (MMR), etc., are provided by the user. A more detailed analysis of mortalities showing age specific mortality patterns together with a listing of contributing factors is given for the model: the mortality pattern for neonates can be seen in Table 4.

Demographic, health problems and health status data thus describe the population to be simulated. Health interventions, if they are different from those in the model, must also be specified. These are described by first constructing a manpower profile and then specifying their deployments to various health and infrastructure activities. The manpower profile for the model health services is given in Table 5. This profile, with 10 multi-purpose workers and 40 community health workers, is suited to an integrated approach.

Table 2. Health Problems

PROBLEM	PARAMETER	MODEL BASELINE	MODEL OUTCOME
Nutrition			
Grade I PEM	% <5 yrs	46%	30%
Grade II PEM	% <5 yrs	31%	15%
Grade III PEM	% <5 yrs	11%	5%
Wasting	% <2 yrs	23%	13%
Maternal and Child Health			
Access to antenatal care	% women	25%	80%
Immunization for TB	% <1 yr	9%	40%
Immunization for DPT	% <1 yr	3%	40%
Immunization for polio	% <1 yr	3%	40%
Immunization for measles	% <1 yr	3%	20%
Immunization for tetanus	% women	1%	15%
Low brith weight	% live births	27%	20%
Complications in obstetrics	% deliveries	30%	20%
Communicable Diseases			
Diarrhoea	% pop/wk	13%	8%
Respiratory infections	% pop/yr	40%	30%
Malaria	% pop/yr	28%	15%
TB	% pop/yr	4%	4%
Round Worms	% pop/yr	40%	25%
Family Planning			
Contraceptive use	% married couples	5%	25%
Environmental Sanitation			
Access to drinking water	% families	72%	80%
Proper waste disposal	% families	70%	80%
Access to Medical Care			
Travel/wait time <30 min	% population	50%	80%
Travel/wait time <60 min	% population	63%	90%
Total with access	% population	71%	98%
Health Education			
Provision of health education	% population	5%	80%
Essential Drugs			
Access to essential drugs	% population	10%	80%

Figure 1. The PHC Simulation

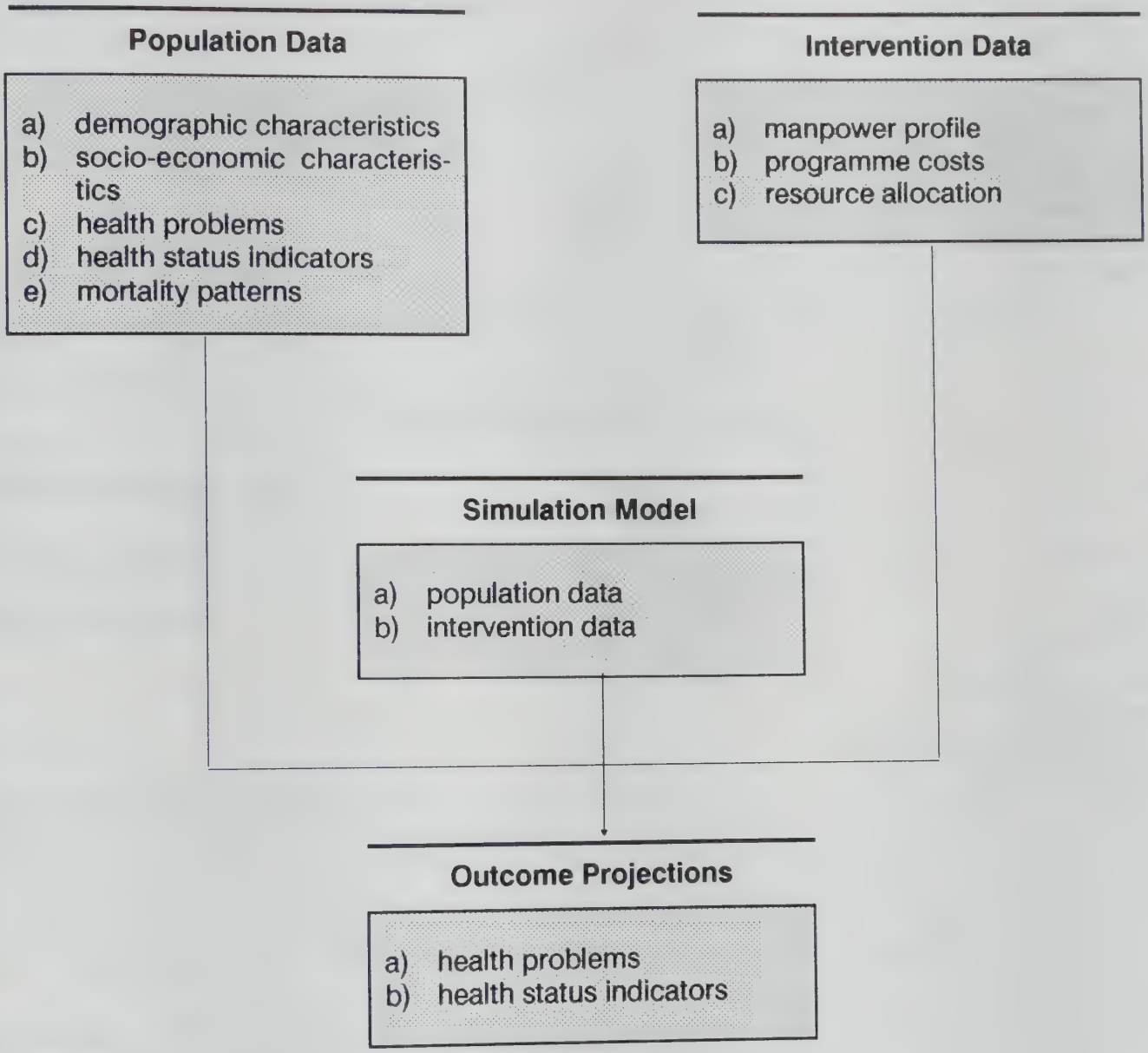

Table 1. Demographic Indicators (Model)

Group	Male	Female	M + F	% of Total	F/M
0 - 4	3,077	2,923	6,000	15%	0.950
5 - 15	6,173	5,827	12,000	30%	0.944
16 - 44	8,511	7,889	16,400	41%	0.927
45 - 65	2,286	2,114	4,400	11%	0.925
> 65	625	575	1,200	3%	0.920
Total	20,671	19,329	40,000	100%	0.935

Annual Population Growth Rate: 3.0%

Table 3. Health Status Indicators

INDICATORS	MODEL BASELINE	MODEL OUTCOME
Crude birth rate	45	38
Infant mortality rate	159	105
Neonatal	96	85
Post Neonatal	63	20
1-4 mortality rate	20	10
Maternal mortality rate	10	4
Crude death rate	15	11

Table 4. Neonatal Mortality

CAUSES	RATE	CONTRIBUTING FACTORS
Low birth weight	27%	frequent pregnancies
Asphyxia	19%	
Birth trauma	18%	maternal malnutrition
Infections -- tetanus	3%	
Infections -- pneumonia	13%	poverty
Diarrhoeal disease	13%	
Congenital malformation	7%	high work load
TOTAL	100%	concurrent maternal infections

Table 5. Manpower Profile and Costs ($1000s)

		Cost/FTE	Model FTE	Model Cost
Professionals	Doctors	10.00	1	10.0
	Nurses	3.00	1	3.0
Auxiliaries	Midwives	1.20	1	3.0
	Sanitarians	1.20		
	Multi-purpose	1.20	10	12.0
	Pharmacists	1.20	1	1.2
	Lab Technicians	1.20	1	1.2
	FPL Workers	1.20		
	Malaria Workers	1.20		
	EPI Workers	1.20		
Community Health Workers	CHWs	0.06	40	2.4
Total Workers			**54**	
Total Salaries				29.8
Maintenance				5.0
Supplies and Materials				3.0
Drugs				24.0
Total Expenditure				**61.8**

Table 6. Resource Allocation (Model)

HEALTH CARE INFRASTRUCTURE ACTIVITIES	DOC	NUR	MID-WIFE	SAN	MULTI PURP	PHAR	LAB TECH	FP WORK	MAL WORK	EPI WORK	CHW
Nutrition	5%	5%			5%						11%
MCH	5%	10%			8%						10%
CDC	10%	10%			10%						10%
FP	5%	10%			5%						10%
Environ Sanit					30%						
Med Care	40%	20%				10%					15%
Health Ed	5%	10%			10%	10%					10%
Dispensing Drugs					1%	40%					2%
Laboratory							70%				
Management	5%	5%			5%	5%	5%				5%
MIS	10%	10%			5%	10%	10%				5%
Logistics	5%	5%			4%	10%	10%				2%
Manpower Dev	5%	10%			12%	10%	5%				10%
Comm. Liaison	5%	5%			5%	5%					10%
	100%	100%	0%	0%	100%	100%	100%	0%	0%	0%	100%

Alternatively, a profile with specialized auxiliaries (family planning workers, malaria workers, etc.) would be best suited to vertical programmes. Some programme costs, including salaries, are included in Table 5 to assist the user in keeping within budget limits.

Each health worker may be involved in one or more areas of health programme or infrastructure activity. A simple measure of work input in a given activity area is the proportion of total time devoted to respective activities. Therefore, in Table 6, the entries to the right of each activity area represent the work inputs of different health workers in the model. Areas like medical care that require highly specialized skills have large work inputs from specialists, in this case doctors and nurses; nevertheless, some medical care activities, like treatment of minor problems, are handled by CHWs and multi-purpose workers. Most other activity areas receive multiple inputs from workers across the board.

Outcome projections are generated once these population and health intervention data have been furnished. Outcome data for the model are given in Tables 2 and 3. There are two salient features of the simulation which have a bearing on outcomes. First, it incorporates a diminishing marginal effectiveness of increasing manpower investment. Simply doubling the manpower allocations in all areas will not result in impact that is twice as great as previously observed but one somewhat less than this (an improvement, nevertheless). Second, programme effectiveness depends on the manpower investment in the functional infrastructure, which includes information systems, management, community liason, etc., much as it depends on the investment in health activities. Investment in the infrastructure is, thus, essential: all health activity and no functional infrastructure makes the health intervention impactless (of course, the converse is also true). "No impact" is interpreted in the simulation as "no change from baseline". An assumption made here is that the population baseline condition is a steady state -- health problems and health status would continue to stay at the same levels without effective interventions.

This simulation was developed at the Aga Khan University to be used for teaching and planning. Health workers and medical students can learn about planning and management of primary health care by examining key decisions and cause and effect relationships, and asking "what if" questions about alternative approaches to resource allocation. They can, in this way, acquire simulated field experience. For this purpose, it is convenient to use model data with a limited number of changes.

For planning purposes, real world data can be used in the simulation. The Aga Khan University is developing PHC programmes for defined populations in several urban squatter settlements. In each field site baseline data have been obtained, which can be used for the simulation. Health programme interventions, including manpower deployments, vary from site to site. Outcomes in terms of changes in health status, which also vary from site to site, are now becoming available and PHC field teams are developing plans and projections based on those observations. These data and projections can be incorporated in the simulation both to describe the evolving conditions of their individual settings, and also to assist in planning future development.

Sensitivity analysis can be used to explore the extent to which the system (simulation, in this instance) outcomes are sensitive to changes in various inputs or interventions. It is a powerful tool for determining optimum uses of resources. The model is set up to do sensitivity analyses (using Enfin Goal Solution application software as "add-ins" to Symphony, version 1.2). Thus, the field directors can test different choices of resource allocation with sensitivity analyses to determine the optimum allocations.

As a planning tool, therefore, the simulation can be used with real data and the model settings may be altered to suit the user so that his intuition and experience form the basis of all estimates of future impact provided by the simulation. Probing at the sensitivity of the system for selected inputs can then point toward optimum use of resources.

The simulation model is built around a series of assumptions, and of course many factors are not included in the assumptions. But the purpose of this form of the simulation is not to reproduce reality, but to isolate and highlight a series of relationships and decisions that are important to planning and decision-making in PHC. The approach here has been to use the microcomputer to develop a model that can be used to simulate populations and related PHC systems, then to adapt that model to actual PHC settings for use in planning, research and teaching.

* * * * *

Oral Rehydration Therapy Effectiveness Model

This programme, developed by PRICOR, has as its basic objective reduction of morbidity and mortality due to diarrhoea in children under the age of five years. It cites four implementing strategies: case management, epidemic control, maternal and child health care practices, and environmental health measures. The latter two strategies consist of preventive and promotive tactics aimed at reducing the incidence of diarrhoeal disease. Epidemic control is aimed at early recognition of epidemics, determination of specific causality, and subsequent application of tactics to limit and terminate them.

This computer model calculates the total number of lives saved in the period between the present and the end of the target year. The user can use the spreadsheet capabilities and modify one or more values and recalculate outcome. At the end of each run the user can request a summary report printout showing input and output values calculated by the model. The model is very easy to use; it includes screen instructions.

"Add-ins" are a group of general utilities that run on other software programmes -- e.g., on Symphony or Lotus 1-2-3. If a general resource use and impact model is built on a spreadsheet, it allows the manager to explore the impact of alternative resource use by using a number of "what if" data inputs.

ENFIN

This add-in utility runs on both Lotus and Symphony. It helps managers with resource allocation analysis through the use of several programme modules.

- Goal Solutions. The user specifies desired goals and the programme finds the values for the designated variables.

- Impact Solutions. The user is assisted in the determination of variable relationships; e.g., which input parameters and variables are most critical in respect to a given objective function.

- Simulated Solutions. Programme uses Monte Carlo probabilistic data to simulate outcomes for up to 18 different probability distributions.

- Optimal Solution. Programme uses linear optimization to arrive at programme solution.

- What If. Programme generates separate form windows for fast and easy what-if scenario building.

Vector Product. This module allows the user to conveniently set up formulas that can be used in linear objective functions and constraints for use in the optimal solution module.

Enfin is a very straight forward and easy to use add-in for those familiar with spreadsheet modeling and utilization.

Plan And Programme Activities

Managers often resist efforts to formalize project planning and tracking. The process is seen as time consuming and not affording appreciable result improvements. There are, however, software packages which can benefit management through paper work reduction and planning flexibility.

Planning Pro

This programme assists the user in the definition of goals, indicators of success, tasks and subtasks, as well as in the development of a schedule for their completion. The programme also allows the user to identify and specify problems that could impede progress, to develop a plan for reducing the probability of such interference, and to anticipate future opportunities. The user is then assisted in the actual management of the plan developed.

Harvard Total Project Manager

This popular software programme, originally developed by NASA for planning and monitoring extremely large construction projects, is basically a PERT or critical path approach to the achievement of goals in the shortest possible time. It also contains a wide range of printable text and graphic reports.

A number of other project planning and monitoring programmes are available as well, including *TimeLine* and *Microsoft Project.* These programmes are all relatively "user friendly" and have good documentation and "help files", though some are somewhat more complicated to use than others.

Monitor Progress

PHC project managers need to keep track of activities for assessing both coverage and efficiency. Many of the functions required, such as payroll and inventory control, can easily be handled using spreadsheets tailored to specific needs with "templates".

Profile

This template for use with Lotus 1-2-3 was developed at the Lisbon National School of Public Health to assist PHC centre directors in monitoring activities, efficiency, and coverage of different health centre units. It is a menu-driven application that requires monthly input of activity and census data. The user can ask for monthly indicators on each health centre unit and can also compare performance between units. Profiles can be generated by unit or for the entire health centre for an entire year.

Visits, home visits, prescriptions, lab tests, sickness leave and other activity statistics are computed per population covered and per unit. All indicators are presented as both tables and bar graphs for easy readability.

This programme is specific to the health centre and cannot be transferred to other decision areas, though the design concept is valid for use elsewhere.

Customized spreadsheets have a great potential for use at the PHC district level. They can be tailored to meet specific needs, are easy to use, and offer the experienced user extreme flexibility.

CONCLUSIONS AND RECOMMENDATIONS

There are several microcomputer-based decision aids which could benefit PHC and child-survival programme planning, monitoring, and evaluation. To realize the benefits of these programmes requires an investment in hardware, software, training, and technical support. These are not trivial requirements.

Hardware

A basic microcomputer hardware configuration for the use of decision aids calls for:

- at least 512KB of available random access memory;
- an 80286 (AT-like) microprocessor;
- an internal hard disk;
- a 1.2 MB floppy diskette drive;
- a dot matrix printer.

Such a minimal system would facilitate a smooth migration to a higher performance system, when necessary and affordable, without having to replace the entire system. The migration route would include:

- 128KB additional conventional random access memory;
- Lotus-Intel-Microsoft expanded memory;
- a 360 KB second diskette drive;
- an 80287 coprocessor;
- a laser printer.

A later migration could include:

- a faster clock;
- extended memory;
- an 80386/80387 main board replacement.

Software

Decision aid software at the community level of PHC should be limited to spreadsheet templates or specific application systems. This is consistent with the nature and extent of management decisions at that level.

At the district level, spreadsheets and their add-ins, database managers, and project management software are recommended. Some applications software, such as Demproj, are also appropriate. The nature and extent of decisions made at this level lend themselves to software utilities. More sophisticated analyses would, however, probably have to be referred to higher levels of the system or done with the assistance of more proficient users.

Forecasting, statistical analysis, project planning, decision analysis, sensitivity analysis, optimization, and simulation software are recommended only for levels above the district. Although these software are powerful, they require considerably more computer knowledge and education to use and are primarily appropriate for more complex decisions.

Training

Training in the use of microcomputers and software should be a continuing process. A microcomputer system thrown in the laps of untrained users is likely to sit in the corner, unused. No software is foolproof; even the simplest knowledge-based system requires some training to use. At the very least, tutorials should be available.

Technical Support

Technical support is extremely important for both hardware and software. Situations always seem to arise when even the most experienced user requires additional support. In lieu of technical support, a user's group may be helpful.

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CONCLUSION

A community health doctor and a community health nurse check completeness and accuracy of data in a special study on health conditions in the urban katchi abadi primary health care programme in Karachi, Pakistan. (Photo by AKU/FHS)

Fresh Approaches and New Tools to Improve Management of Health Systems Based on Primary Health Care

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STRENGTHENING PHC STRATEGIC AND OPERATIONAL APPROACHES

- *Recognizing The Determinants Of Health*
- *Emphasizing Basic Minimum Needs And Quality Of Life*
- *Promoting Community Participation In The Managerial Process*
- *Translating PHC Strategies Into Action: District Health Systems Based On PHC*
- *Increasing Efficiency Of District Health Systems Based On PHC*

FASHIONING BETTER TOOLS TO MEET MAJOR PHC MANAGEMENT ISSUES AND PROBLEMS

- *Enhancing Appreciation Of Information For Better Management*
- *Broadening The Programme Scope And Specifying Strategy, Objectives And Targets As The Basis Of Management Information Systems*
- *Improving The Efficiency And Utility Of Data Management*
- *Facilitating Appropriate Uses Of Microcomputers And Information Technology*

GUIDELINES ON DEVELOPING AND STRENGTHENING MANAGEMENT INFORMATION SYSTEMS FOR PHC

GUIDELINES ON TRAINING, SUPPORT AND NETWORKING BY REGIONAL, MULTINATIONAL AND INTERNATIONAL ORGANIZATIONS

The workshop was organized in recognition of the serious need for increased effectiveness and efficiency of primary health care (PHC) programmes, particularly in Third World countries. This need is given all the more urgency by worsening economic conditions, rapidly growing populations, and commendable efforts in a number of countries to mount large-scale PHC programmes despite diminishing per capita health resources.

The workshop dealt with some of the most pressing issues in health care today, through five technical working groups (TWGs) focused on the following subject areas:

- Community-Based PHC Management Information Systems;
- Management Information for District Health Systems based on PHC;
- Cost Analysis in PHC Management Information Systems;
- Microcomputers and Alternative Data Management Techniques;
- Microcomputers in PHC Planning and Management Decision Modeling.

Conclusions of these TWGs have been presented in the five preceding chapters.

By bringing together experienced professionals from key disciplines -- community-based PHC programme planning and management, microcomputers and information technology, epidemiology and statistics, PHC operations research, and non-government organization (NGO) administration -- in an environment with an array of microcomputers, software and other management information systems (MIS) resources, the effort to

address priority problems became creative and productive, both within and outside the TWGs.

This chapter addresses some of the broad generic issues that were beyond the concerns of the individual TWGs, concerning major PHC management problems and relevant new management approaches, but which were identified as particularly important by the participants.

They are organized into two broad categories:

(1) strengthening PHC strategic and operational approaches

(2) fashioning better tools to meet major PHC management issues and problems

Overall, the discussion focuses on how the specific organizational, programmatic and managerial problems of PHC can be overcome by improved management systems, taking special note of the advantages and limitations of microcomputers and related new technologies.

STRENGTHENING PHC STRATEGIC AND OPERATIONAL APPROACHES

Recognizing the Determinants of Health

It is widely recognized that the determinants of health fall outside as well as within the conventional scope of the health sector. Consequently, PHC planners and managers need to take a multi-sectoral approach to be informed about relevant conditions which fall outside the health sector and to mount activities which strike at the determinants of health wherever they lie.

> Determinants of health which lie outside the health sector include the educational level of women, employment and/or family income (whether in cash or in kind), availability of food, reasonable housing, and basic security.

Thus, many PHC programmes now include income-generating activities, education and training of women, family and community vegetable gardens, fish ponds and animal husbandry, in addition to conventional health services.

Notable advances were reported at the workshop on two impressive programmes: Thailand's Social Development Programme, operated by the National Economic and Social Development Board and, on a much smaller scale, the Kisumu PHC Programme, operated by AKHS in collaboration with the Government Health Services in Kenya. As these programmes mature, it seems likely that lessons can be learned, particularly with respect to how MIS fit into and support decision-making in multi-sectoral programmes. Various interested parties, such as donors, NGOs, and appropriate sectors of government (e.g., health, education, agriculture, interior, communications, etc.) should look to the possibilities of applying such lessons in their settings.

Conclusions:

- *PHC programme strategies should take into account the major determinants of health, whether inside or outside the conventional health sector, and apply appropriate interventions to establish lasting improvements in health status.*

- *Integrated development programmes in which PHC is a major component should involve multi-sectoral interventions, carefully managed by a multi-disciplinary management structure, including relevant government sectors and non-governmental organizations. Both private sector and government sector resources should be utilized in a well coordinated fashion to avoid duplication of effort and waste of valuable resources.*

- *Integrated programmes should be supported by a reliable management information system which has a scope substantially broader than that of the conventional "health" management information system.*

Emphasizing Basic Minimum Needs and Quality of Life

Thailand's Social Development Programme with its basic minimum needs and quality of life focus presents a "holistic" approach to development at the individual, family, community and societal levels. This approach takes into account all aspects of Thai life, identifying the basic minimum needs, the improvements of which can result in substantial uplifting of the quality of life. Thus, the

scope of the programme extends beyond the conventional scope of the usual governmental sectors (e.g., health, education, agriculture, interior), to include important elements of individual, family and community well-being, including the moral, religious, and law abiding aspects of life. The management information system which supports the Social Development Programme covers the same range of subjects. The far-reaching presentations given by Dr. Krasae Chanawongse and Dr. Orapin Singhadej of the ASEAN Training Centre for PHC Development (ATC/PHC) on the Thai Social Development Programme raised important new issues and challenges to be met by PHC management teams.

Conclusion:

- *The integrated, multi-sectoral Social Development Programme in Thailand is an important experiment in "holistic" development at various societal levels. It has considerable potential for adaptation and application in other countries and locales where there is a receptive framework for such advanced development activity.*

Promoting Community Participation in the Managerial Process

A major emphasis of the workshop was community participation in the managerial process. Thailand's Social Development Programme and the Kisumu PHC Project are examples of settings in which such activities are underway, including the use of management tools by community health workers (CHWs), community health committees, women's action groups, and other community members, such as traditional birth attendants and others.

> Enough experience has accumulated to demonstrate that communities do have the capacity to analyse and manage their own health problems effectively, given technical and organizational advice from sensitive and capable PHC managers and field supervisors.

A touching example of community members taking responsibility for their own health comes from the Aga Khan University's Urban PHC Programme in Karachi in which a CHW's community map was used to identify which households had high-risk children with varying degrees of malnutrition by using pins of different colours. One day, a CHW triumphantly walked up to the map and pulled out the red pin that designated the household as having a high-risk, malnourished child. The mother had taken the good advice of the CHW and had properly fed her child until he was no longer malnourished; together the CHW and mother had conquered malnutrition and symbolically celebrated the event by dramatically removing the pin from the map.

Community mapping is one example of an appropriate and effective management tool for community application. It is a time-tested method for identifying and monitoring households with malnourished children, unimmunized or partially immunized children, contracepting women and men, pregnant women and others who need followup care, as well as monitoring community water sources, new pump sites, environmental hazards and environmental improvement activities.

Road-to-Health growth charts for monitoring children's weight-for-age, immunization status, illnesses, and related events is another established management tool to help promote health and good nutrition at the family and community levels. An especially useful *Community Road-to-Health Chart* can be made by recording all malnourished children on a single chart to show both distribution of malnourished children and trends in the constantly changing nutritional status of children in the community. It is also possible to mark the names and households of the most severely malnourished as a visual guide to priorities for follow-up action.

Community dialogues, simple surveys and group analysis of results by community members are the principal methods of involvement of community members in planning and management.

Conclusions:

- *Community participation in the managerial process is occurring in the more advanced and progressive PHC programmes and contributes to their achievements and sustainability.*

- *Simplified yet quantitative methods for monitoring the inputs, outputs, effects and impact of local PHC programmes need to be developed in consultation with community*

members. CHWs and other community members could then apply such methods, after they have been field tested and their utility has been demonstrated.

Translating PHC Strategies into Action: District Health Systems Based on PHC

The workshop focused on district health systems based on PHC and on the associated need for management information by both district health management teams and community PHC leaders. The information needs of these two groups can be quite different and, presently, information is rarely fed back to CHWs and other community leaders.

The concept of a "district health system based on PHC" emerges from the conjoining forces of greater "district focus" in development planning and administration and of the support needs of rapidly expanding PHC programmes.

Conceptually, the district health system subsumes all government and NGO health facilities, personnel (including private practitioners), and services within a geographically delineated area, including all community-based health care activities, whether or not they are formally related or have any functional linkages with health care organizations.

As community-based PHC programmes expand to cover ever larger populations, the management capacities of district health systems become strained and deficiencies become apparent at both the district level and at the periphery of the district system.

Community-based PHC programmes create new and heavier demands for technical assistance, supplies, services and information.

"Upward planning" by communities and "downward support" by government and NGO health services remain more a concept than a practice. If PHC initiatives are to progress, government health services and other sectors operating at the district level must find effective ways to support these initiatives. This means substantial reorientation of management at the district level, as well as appropriate improvements in MIS for use by both district-level and community-level decision-makers.

Conventional record-based information systems need to be adapted sufficiently to reduce the record-keeping and report-writing workload of health workers to enable them to apply more time to service provision and technical guidance for community-based PHC initiatives.

District health management teams often handle such extensive amounts of data and analytic information to warrant establishing a district-wide, microcomputer-based MIS. Depending on local conditions, this might be justified on the basis of cost savings in personnel time and improved quality of data processing, analysis and presentation. Microcomputers offer a rapid data processing capacity that can return analysed data to its source in a short time.

Increasing Efficiency of District Health Systems Based on PHC

Better coordination between NGOs and government health services and between community-level, health centre-level, and district-level management teams can substantially improve the use of available resources.

Both NGO-governmental linkages and community-based health care (CBHC)-district health system linkages are important to foster and build upon for improved management, coordination and financing of health care. These concepts are readily accepted in principle, but are difficult to operationalize in terms of their implications for district health management information systems and for "community level" management and MIS when, ideally, they should be conceptually and functionally inseparable.

The main problem stems from the legitimate and desirable sense of "ownership" which progressive communities develop towards "their" community-based health care activities which, more often than not, vary from those of district health management teams which are at the managerial pivotal point in terms of being responsive to both (a) the support needs of community-based PHC and (b) the requirements,

priorities and activities which are mandated from higher levels of the organization. Issues of "territoriality" and "ownership" need to be overcome before the district health system based on PHC can be fully operationalized.

Increasing efficiency by increasing the effectiveness of health care can be achieved by reorienting health strategy, personnel, finance, and activities towards health promotion and disease prevention which have greater long-term effects and impacts than curative care alone. This is a fundamental concept and focus of any PHC programme and it is progressively gaining attention by district health management teams and at higher levels of organization.

Increasing efficiency of district health systems based on PHC requires that an alert, responsive, well-trained and well-informed management team take decisive action based on appropriate, up-to-date and accurate information. However, adequate information for the managerial process is one of the major needs in health today.

With up-to-date, reliable data on health problems, health status, allocation and use of human, material and financial resources, and provision and uptake of services, the health manager can more effectively and efficiently assess the health situation, determine top priorities, supervise staff, monitor and reallocate existing resources, and increase overall programme performance.

PHC management information systems must have the capacity to provide PHC managers and health workers with current data and analytic information on dynamic, constantly changing conditions of the population, health service organization, and social and environmental determinants of health.

Conclusions:

- *Governmental and non-governmental health services organizations should have the capacity and be prepared to provide multi-disciplinary and multi-sectoral support and assistance when requested by progressive communities which have established community-based PHC, basic minimum needs (BMN), or other local integrated development programmes requiring multi-sectoral inputs.*

In India, a PHC management team reviews progress of a community-based health care programme with a village leader. The management team includes a health educator, a sanitary engineer, a training officer, and a research analyst. (Photo by South/East Asia Regional Office, World Health Organization)

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- *NGOs, government health services and other governmental sectors will need to reorient their personnel and resources to support, responsively and responsibly, community-based and community-managed PHC and BMN programmes.*

- *The District Health Officer and his management team, including the information officer, should be offered or required to undertake training in basic management techniques appropriate to the district health system. They should have regular consultations with community-based PHC leaders and jointly undertake planning of local health and development activities.*

- *As appropriate to local settings, multi- disciplinary, multi-sectoral district management teams should involve both governmental sectors and NGOs to assess all available resources and to develop a comprehensive and integrated plan for the area.*

- *The District Health Officer and his management team should work closely with community health leaders to assess their respective needs for management information and then conceptualize and implement an integrated MIS.*

- *The district management team should provide ongoing technical assistance to community health leaders to help them understand better what the data means and how it can help them to achieve the objectives of their local community-based PHC or BMN programme.*

FASHIONING BETTER TOOLS TO MEET MAJOR PHC MANAGEMENT ISSUES AND PROBLEMS

Pre-workshop preparations aimed to identify major problem areas of management information systems which would help focus workshop deliberations. In addition, four PHC programmes in the Aga Khan network conducted self-appraisals of their management information systems and use of microcomputers, followed by on-site visits by two consultants who then analysed the results of the four case studies.

These case studies and the workshop deliberations highlighted four major problem areas of PHC management information systems which largely account for the current and widespread lack of reliable information for the managerial process:

(1) a general lack of appreciation of the utility of data for better management;

(2) inadequate definition of programme strategy, objectives and targets as the basis of a management information system built upon appropriate and practical management indicators for monitoring inputs, outputs, effects and impact;

(3) inefficient and/or inadequate collection, processing, analysis, presentation, and use of data for the managerial process;

(4) insufficient or inappropriate use of microcomputers and information technology.

Enhancing Appreciation of Information for Better Management

The general lack of appreciation of the utility of data, management information systems and basic management methods is one of the major reasons why health service organizations have inadequate information for the managerial process. If data is not valued, there is little incentive to ensure high quality data collection, processing, analysis and use in the managerial process.

Incomplete and inaccurate recording of data are most often associated with a lack of understanding of how the data can be used, a belief that data is collected only for purposes of upward reporting, and that it won't "make a difference" in any case. However, when data are collected for local use -- such as conducting a community "diagnosis" or when family health records are updated to help identify children and women "at risk" -- the completeness and accuracy of reporting improves substantially. Incentives for completeness and accuracy of reporting can improve performance, but such incentives should not be linked to the type or quantity of data as this might introduce "biased" or false data.

Every level of the organization needs to understand why and how data is collected, tabulated, and analysed at each level to improve decisions on priorities and resource allocations. Aggregated data and analytic information should be reported back to those who collected the data,

and managers and information officers should seek feedback on the MIS from health workers at each level of the system.

The decision on using microcomputers should take into account the pros and cons of computer technology, including possible employment trade offs, costs of introducing improved systems, and the marginal costs of improving the system and generating better data.

> The design of the information system should be a systematic process of analysing programme strategy, objectives, impact and operational targets, information needs and use, and methods of generating the information. The MIS should specify data management procedures, and appropriate microcomputer software and hardware if the latter are to be used.

The starting point of this systematic approach is an analysis of programme strategy, objectives and operations. For example, the health-for-all strategy emphasizes equity, universal coverage and community participation in PHC. Equity and universal coverage factors require managers to think and plan in terms of population-based data to identify major needs and priorities. Community participation requires managers to help communities plan and manage their own activities, often using simpler methods, and to understand local "group dynamics" and patterns of leadership and influence.

Health managers' roles, responsibilities and managerial methods are changing rapidly. However, PHC programme managers and information officers often lack appropriate training in data management, analysis and interpretation of health and related financial data, and basic methods of management, monitoring and evaluation of health programmes. While management courses exist at some North American and European universities, they cannot meet the Third World need for training due to high costs, governmental restrictions, language and communications constraints, and university admission policies, which effectively obstruct access by most health workers who need this training. In any case, these institutions generally lack immediate access to field sites where functional management information systems are in place.

Building recognition of the utility of information for management decision-making is likely to require substantial reorientation of staff, including provision of ongoing training and technical support for key staff to ensure smooth transitions to more effective procedures to improve the overall management process.

Conclusions:

- *Lack of management training for PHC leaders is such a fundamental problem that development of management training programmes must take a high priority if substantial improvements are to be made in health programme management, effectiveness and efficiency.*

- *Health Management Training Programmes should be conducted with regularity in sufficient locations to impart fundamental planning, management, monitoring and evaluation skills -- including skills in data management, analysis and use -- to health workers of various types who are working on PHC management teams.*

- *Ministries of Health are encouraged to establish national health management training courses and in-service refresher courses for their own personnel as an integral part of health training and career development.*

- *Regional health management training courses need to be established for the purpose of training management trainers who can then set up similar courses at the national level for governmental and for NGO planners and managers of PHC programmes in their own countries.*

- *Government health services, non-governmental organizations, international and bilateral assistance agencies, and donor organizations are encouraged to give health management training programmes high priority.*

Broadening the Programme Scope and Specifying Strategy, Objectives andTargets As the Basis of Management Information Systems

While many PHC programmes have statements of objectives, plans of operation and general descriptions of expected outcome, too often these are not based on a clear strategy and a systematic plan of implementation with achievable

operational and impact targets. Take, for example, a PHC programme in an area with a high prevalence of diarrhoea and high infant and child mortality rates, the reductions of which are given as objectives, but which has no clear action plan on oral rehydration therapy (ORT) for home-based management of diarrhoea. Another PHC programme has the reduction of neonatal tetanus as its objective, but has no action plan to identify and immunize all women of child-bearing age with no history of tetanus immunization.

Many PHC programmes set objectives which cannot be achieved by planned operations and activities in the given time frame or with available resources, or set targets which cannot be measured by objectively verifiable indicators.

Few PHC programmes have clearly-stated targets or appropriate and practical management indicators relating to operations outputs (e.g., numbers of mothers trained on home-based ORT or ORT packets distributed by a CHW per month), effects (percent of mothers able to properly prepare home-based ORT, or percent of childhood diarrhoea cases treated with ORT), and impact (e.g., reduction of childhood diarrhoea case fatality rate, or a reduction of infant and childhood mortality rate attributable to diarrhoea).

Programme strategy, objectives, targets, and operations need to be inter-linked and analysed in terms of financial and other resource allocations so that questions concerning affordability and efficiency can be answered and, if necessary, the programme's objectives, strategy, targets and operations revised accordingly.

Management-by-objectives or similar methodologies are applied far more infrequently than the sadly more familiar "management-by-crisis" which has characterized inefficient health organizations for so long. There are historical reasons for this phenomenon. Until recently, health organizations were largely facility-based, demand-oriented and inclined to avoid adequate data collection and processing and generation of management information. Today, health organizations can no longer afford to waste resources through "management by crisis" or by managing without proper instruments to take informed decisions.

Primary health care has brought a major new challenge to health planning and resource allocation because of the fundamental principles of equity and universal coverage.

Health care organizations can no longer remain "facility-based" and passive if they aim to have impact on the health status of their "catchment" populations. Managing health care organizations today requires far better use of limited health resources to achieve universal coverage and equity. PHC programme managers, supervisors and health workers at all levels need to think in terms of population size, target population (e.g., children under two years and women of childbearing age), population subgroups at high risk (e.g., children under age 5 years who are low weight for age, low birth weight newborns), and coverage of these groups with appropriate surveillance (e.g., growth monitoring) and services (e.g., immunizations).

Conclusions:

- *Health service organizations -- NGOs and governmental health services alike -- and donor organizations should encourage a thorough, systematic approach to planning and management, clearly linking programme strategy, objectives, and targets in terms of inputs, outputs, effects and impact on the population of the programme.*

- *Systematic planning and resource allocation should be emphasized in local, national, and regional health management training courses. Health training institutions should provide practical methods and skills for the conduct of effective health management.*

- *Given PHC principles of equity and universal coverage, MIS for PHC should be based on reliable, up-to-date management information, including population-based data sets. The MIS should describe local situations in terms of rates, ratios and populations coverage, rather than relying on "numerator" data only.*

- *Conventional information systems, generally unidirectional from the periphery to the central level, originally conceived for facility-based medical care, should be supplemented (or supplanted) by popula-*

tion-based, priority-oriented, resource-sensitive management information systems. Managers should periodically assess progress, adjust programme strategy and methods as indicated, allocate resources more appropriately and, thereby, promote increased programme effectiveness and efficiency.

Improving the Efficiency and Utility of Data Management

Given the substantial differences between the conventional facility-based management approach and the population-based PHC management approach, a major concern of workshop deliberations centered on methodologies for collecting, processing, presenting and using data.

A community-controlled MIS for monitoring a community's "own" community-based health care programme must be highly flexible, directly relevant to priorities and activities agreed on by the community, and operationally simple for use by CHWs and other community members who generally have limited education and training.

The MIS of a district health system, on the other hand, must meet the requirements and directives of the Ministry of Health and of district officials, and -- at the same time -- respond to information needs of CHWs and community members. It is conceptually and operationally difficult to meet these varying demands because of the limited flexibility of government records and procedures.

A major problem associated with conventional, **record-based data** collection is the substantial amount of time that health workers must devote to information demands. A large proportion -- most studies indicate 40-60% -- of the total time available is spent collecting and recording data and writing reports; yet, the resultant databases often show little decision-making relevance. Some of the data is superfluous and could be eliminated, but most of the data is simply collected and reported inefficiently. The cost of operating record-based information systems is high, particularly when one considers the personnel time lost to service provision as a result of excessive paper work.

In contrast to conventional record-based reporting systems, **alternative data management techniques,** such as special studies, rapid surveys and management audits have the potential for resource conservation. Though time and personnel intensive, these techniques can reduce the time spent on routine record keeping and reporting while, at the same time, allowing rapid acquisition, analysis, feedback and use of data. These tools are of special relevance in situations where urgent decisions are required.

Special studies, family health records, and streamlined reporting -- assisted by microcomputers where appropriate -- can substantially improve programme management performance and efficiency, but only if the accuracy and completeness of data entry is ensured. Thus, supervision of data collectors and quality control checks are of major importance. (Photo by AKU/FHS)

Management information for health systems based on PHC should include **data on programme costs**, including some measures of programme efficiency, and cost-benefit or cost-effectiveness as a means of guiding management decision-making on alternative, "best choice" allocation of available resources to achieve programme efficiency. The traditional separation of financial data from health service utilization information must be overcome if programme cost-effectiveness is to be measured in a way useful to management.

Another area of concern is **data presentation and graphics** to enhance interpretability and utility of the data to the intended user. Data presentations should convey relevant information in a manner which assists management decision-making.

Conclusions:

- *Well-designed data collection systems, coupled with special study techniques, can reduce the cost of data collection, processing, and analysis.*

- *MIS for health systems based on PHC should increasingly be conceptualized, tested and implemented in consultation with community leaders, CHWs, and field supervisors, each of whom should understand how particular data can be used in their work, how to provide feedback, and how to overcome problems of data collection, processing and feedback and use.*

- *MIS for health systems based on PHC should incorporate cost data required to deal with cost-benefit and cost-effectiveness questions, while recognizing that the data presently available will fall short of that required for rigorous analysis.*

Facilitating Appropriate Uses of Microcomputers and Information Technology

The workshop focused considerable attention on the applications of microcomputer technology in MIS. It recognized that microcomputer technology has immense potential in MIS for PHC, and this potential needs to be explored, tested and advanced. At the same time, the workshop appreciated that microcomputer technology is not suitable for all situations and all occasions, particularly in Third World settings. It is important not to attempt to apply microcomputer technology where personnel are not ready for it or where it might actually create dependencies. A sense of appropriateness is important in making judgments about the applications of microcomputers.

Once the microcomputer is introduced, care must be taken to avoid the entry of too much data and the use of the microcomputer as the main means of ensuring quality of data. It is ironic that one of the microcomputer's most significant characteristics -- its ability to store and process large amounts of data -- has the potential for a negative impact on management. Despite these cautions, the microcomputer has strong potential as a tool for achieving PHC programme objectives efficiently while conserving scarce resources.

> Well designed data collection systems, coupled with special study techniques and microcomputer processing for fast turn around responses, can significantly improve management performance and at the same time free up to 20% of PHC workers' time for other health-related activities.

Another role for the microcomputer is in **modeling and simulation**. Business and industry have used these techniques to facilitate planning and analysis for many years. PHC and other social development programmes should also benefit from their use. Microcomputers and decision-support software can assist in the **scheduling and provision of services**, in population **forecasts**, in planning and **tracking** project activities, and in **evaluation and research**. All of these applications can boost productivity by providing management with relevant and timely data for more informed decision-making.

Another important role of the microcomputer is in **education and training** of personnel. Visually enhanced tutorial diskettes can be used for self-instruction, continuing education, and special training programmes. A benefit would be familiarity gained in using interactive video-disk programmes which apply "touch screen" microcomputer displays and laser disk technology; at present, however, the cost of these programmes is substantial.

Nonetheless, a variety of health-related concerns have been addressed using the microcomputer; these have ranged from personnel and supply **inventories** at the ministry level to **surveys and special studies** data management in the field. While some stories of expensive equipment relegated to the closet exist, the overall impression

of microcomputer contributions to health and other social services is a positive one. Problems associated with the use of microcomputers in areas of environmental stress (e.g., erratic power, heat, humidity, dust) have been largely overcome.

The potential for microcomputers to contribute to managerial efficiency is not enough, however. The microcomputer must also be shown to be cost-effective and to have a positive impact on PHC outcomes. The microcomputer must be judged by the same criteria used to assess other PHC inputs. An approach to study the microcomputer's cost and effectiveness would be a before-and-after microcomputer-introduction comparison of factors such as time saved, data utilized, decisions made, resources employed, and improved quality and availability of health indicators. Bertrand et. al. have developed a list of indicators (included in Chapter 12) for judging the impact of a microcomputer-based information system once it is in place; these indicators suggest the kinds of changes that can be expected after the introduction of microcomputer technology at varying management levels.

Another approach would be to use a **special study** technique such as Delphi to develop a model of probable outcomes; the model could be validated when actual before-and-after comparison data becomes available. This two-pronged approach to the problem would benefit not only the evaluation of microcomputers in PHC but also the use of "models" as predictors of PHC outcomes.

A significant unknown is the cost -- over and above that for hardware and software -- of introducing and sustaining the microcomputer. Bertrand reports personnel training experiences -- from which some costs can be deduced -- ranging from a Zairian high school teacher to United States-based administrators; the teacher was judged competent to operate the system after less than two days of training, whereas the administrators proved much more difficult to train. The AKCHP experience in Dhaka also points toward the potential for using unskilled labour to operate the microcomputer; there, volunteers and high school students are not only entering data but writing computer programs as well. Bertrand also points out the possibilities of microcomputer maintenance by local personnel, thus providing yet another possible lead to cost evaluations.

Support costs for personnel training and supervision, system maintenance and repair, and supplies also need to be evaluated. Other less visible but nonetheless important costs are those associated with labour reclassification and/or replacement and with programme disruption during microcomputer introduction.

An important element of cost that has received insufficient attention is that of national policy as it relates to foreign exchange constraints. The world economic system, and the consequent currency controls, do not allow individuals or governments free reign in matters of acquisition.

Conclusions:

- *Microcomputers and decision-support software -- when they are available and well used by trained personnel -- are valuable managerial tools for use in the PHC development, implementation, and evaluation process.*

- *The microcomputer can facilitate improved management through timely and informed decision-making, but only if there is an appreciation of the data, its significance, and its utility. The MIS database must contain the data most relevant to decision-making.*

- *Microcomputers, in conjunction with well-designed data collection systems and special study techniques, can improve PHC programme management efficiency and, at the same time, play a significant role in reducing the time spent by the PHC worker in data-related activities.*

- *Quality control should start at the earliest stages of data collection and recording and then be maintained throughout the system; the microcomputer should not be used as the primary means of improving data accuracy, though computer error-trapping techniques are appropriate. Accuracy and completeness of data in the collection phase is of paramount importance in any MIS.*

- *Special consideration should be given to the identification of training needs, learning abilities of health workers, and the technical supervision and support needs of the district health care system based on PHC.*

In Nigeria, a government health worker and a CHW conduct a rapid survey to collect data for strengthening management of the local PHC programme. (Photo by D. Henrioud, African Regional Office, World Health Organization)

GUIDELINES ON DEVELOPING AND STRENGTHENING MANAGEMENT INFORMATION SYSTEMS FOR PHC

Recognizing the rapidity of developments in micro-informatics, the need for improved MIS, and the social benefits which would follow the dissemination of information on improved MIS and microcomputers in PHC, a concensus developed at the workshop to encourage advances in these important and promising new fields. While the benefits could be felt by people around the world, the major benefits would be derived by people living in developing countries who do not yet have the tools to manage their own health and their own health resources.

The workshop recognized the substantial social development benefits which could be derived by better management of scarce resources aided by improved management information systems which, in appropriate circumstances, could take advantage of one of the most powerful management tools available today: the microcomputer.

Major Guidelines:

- *Establish clearly stated programme strategy, objectives and targets with respect to expected outputs, effects and impact;*
- *Select and clearly define appropriate and practical management indicators for monitoring and assessing inputs, outputs, effects and impact;*
- *Determine and clearly describe essential data items, analytic processes, and data presentation formats for management information needed by health programme managers to monitor inputs, outputs, effects and impact;*
- *Involve data collectors and field supervisors in the design of data collection instruments, records and reports and in data feedback reviews as these can provide strong incentive to maintain accurate and complete records, as well as having an educational value at the field level;*
- *Involve data collectors and field supervisors in the use of data collected to facilitate local understanding and decision making.;*

- *Provide sufficient opportunity and time for training key managerial and supervisory staff, improving technical support at all levels, and developing effective methods of data feedback and use -- as the process of introducing new management methods and tools requires changing patterns of behaviour, staff relationships, and standard operating procedures, if not a full reorganization of the health system;*

- *Foster clarity of understanding by and concensus between PHC managers, supervisors, and MIS technical officers on programme strategy, objectives, targets and indicators, and on MIS objectives, methods, and presentations of data -- and on its use and feedback -- including periodic joint assessments of the MIS and associated management methods;*

- *Develop minimal record-keeping and reporting requirements for local record-based management information systems;*

- *Develop and test alternative data management techniques appropriate to local programmes and district health systems based on PHC;*

- *Develop specific data-based managerial methods appropriate to district health systems based on PHC, emphasizing the particular roles of various health workers, their training needs and their technical support requirements;*

- *Develop and test training materials and other resources for education and training on management information systems and, where appropriate, microcomputer applications to improve management of health and development programmes;*

- *Initiate health management training activities in consultation with field personnel and revise training to meet needs of managers and field personnel;*

- *Initiate, as appropriate, microcomputer-based health management training activities, including the development and field testing of visually-enhanced, audience-specific management information system tutorial diskettes.*

GUIDELINES ON TRAINING, SUPPORT AND NETWORKING BY REGIONAL, MULTINATIONAL AND INTERNATIONAL ORGANIZATIONS

Organizations which have the capacity to launch or enhance networking activities and regional education and training programmes -- such as Volunteers in Technical Assistance (VITA) in Washington D.C. (possibly assisted by a university), the ASEAN Training Centre for PHC Development in Thailand, and the Aga Khan University Faculty of Health Sciences in Karachi and possibly other universities -- are encouraged to consider the guidelines given below.

Major Guidelines:

- *Develop regional health management training courses appropriate to the needs of health workers in the countries of the particular region.*

- *Develop mechanisms for on-site management information system development assistance.*

- *Develop management and evaluation methods to enable comparative studies to be conducted which can accomodate project diversity.*

- *Develop, test and provide guidelines on various MIS models, including both manual and microcomputer-based MIS models, and show how to assess the relative impacts of improved record-based MIS, special studies and other alternative data management techniques, and the use of microcomputer-based MIS on PHC programme outcomes.*

- *Develop regional microcomputer hardware/software information resource centres, including a loan programme of both hardware and software.*

- *Develop effective methods for disseminating information on management information systems and microcomputer applications to strengthen management of PHC and BMN programmes.*

The workshop concluded with a clear sense of the importance of following up on the recommendations and conclusions given above and in the Technical Working Group reports (Chapters 9 through 13). A sense of urgency is added by recognition of the need to improve health management as a means of expanding health care in the face of diminishing resources. Substantial improvements in health management are offered by improved management information systems and better use of management tools which, to date, have been greatly underutilized.

A number of management tools discussed above can be applied at community and service provision levels immediately and at low cost. For example, road-to-health growth charts to monitor growth and nutritional status of children, "community" road-to-health charts to monitor community nutritional status, village mapping with indicators of women and children "at risk" within registered households, and similar management tools can be used effectively by community health workers.

District health systems based on PHC have a number of management tools available to monitor inputs, outputs, effects and impact of the system. For example, cluster surveys can quickly assess immunization coverage; and cost data, if properly maintained in a predetermined manual for future analysis, can enable managers to compute measures of efficiency as well as coverage and effectiveness.

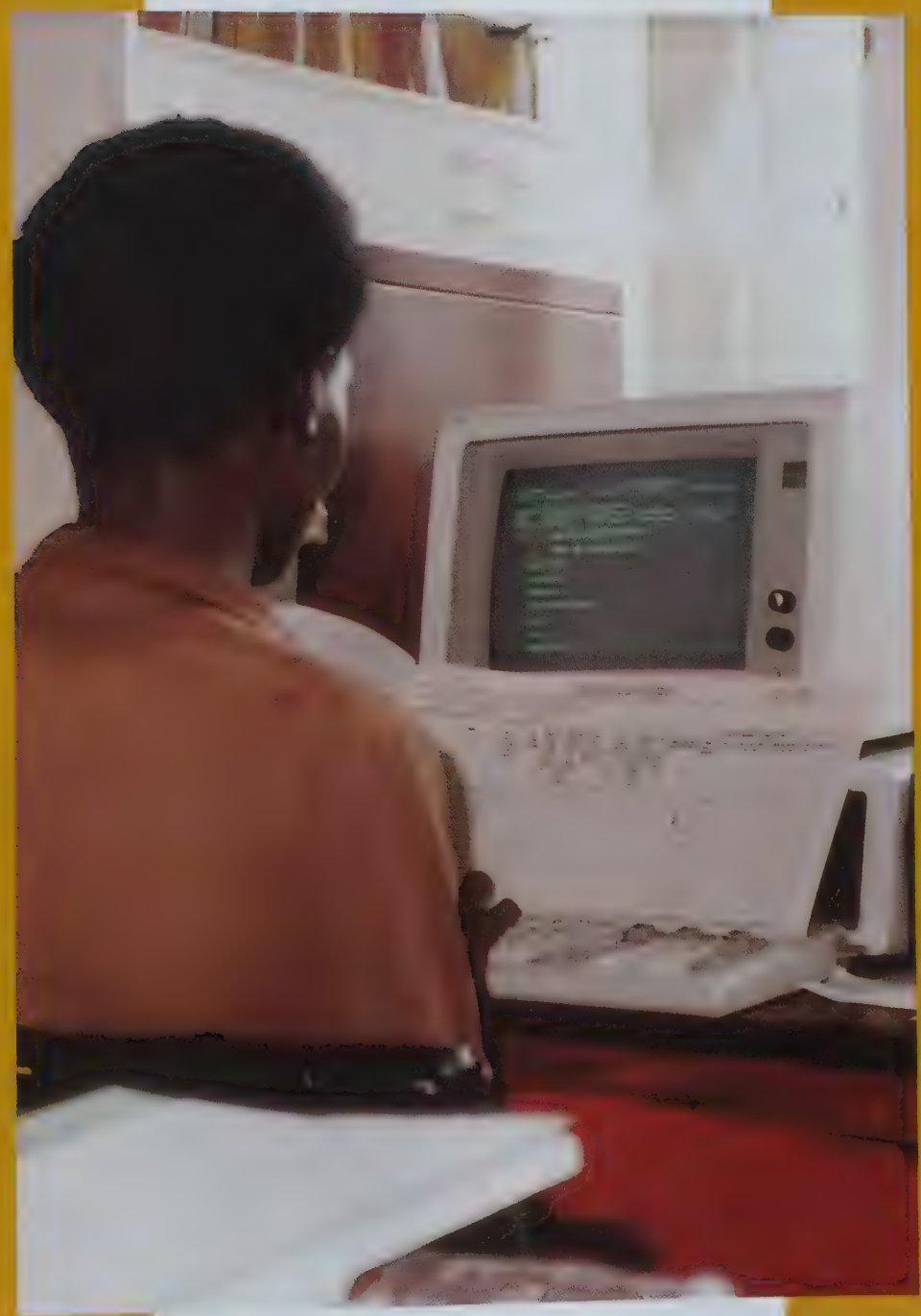
In any MIS, accuracy and completeness of data recording and entry is of paramount importance to the utility of the data.

Health managers can improve MIS and the quality and appropriateness of management information with or without microcomputers. However, in large systems which handle substantial amounts of data and require more analytic information, microcomputers can make a substantial difference.

Microcomputer technology, alternative data management techniques, and management decision modeling can substantially improve health management and the effectiveness and the efficiency of health systems when used by well-trained health workers in appropriate circumstances.

Improving management information systems and microcomputer applications in PHC requires use and/or adaptation of known and evolving technology to local needs and circumstances. These adaptations and applications of technology for improving health management should be undertaken along the lines identified above, thus advancing both the state of the technology and its spread to countries and communities who can benefit from it. In so doing, the basic minimum needs of the majority of people in the world today can be met most effectively and efficiently.

APPENDICES



A data entry clerk enters field data for analysis with SPSS software at the Primary Health Care Unit of the Aga Khan Hospital in Kisumu, Kenya. (Photo by Aga Khan Health Service, Kenya)

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AKF: Standard Indicators for Monitoring and Evaluating Primary Health Care Programmes -- Assessment Of Their Management Utility

The following indicators were found to be highly useful for management purposes (receiving 3-4 "most useful" ratings and no "least helpful" ratings).

- Ratios between the population in various administrative units and health facilities and health manpower available, e.g., population per: CHW, trained TBA, health center worker (by type of worker), nurse (by type of nurse), physician, health center.
- Percentage of mothers who know how to properly prepare and administer homemade ORT solutions.
- Percentage of homes with children under 5 years or with pregnant women visited by CHW within the past month.
- Percentage of women delivering who were immunized prior to delivery against tetanus.
- Percentage of children age 12 through 23 months who are fully immunized with BCG and with DPT, measles and polio vaccines.
- Infant mortality rate (IMR).
- Child mortality rate (CMR).

The following indicators were found to be somewhat useful for management purposes (receiving 1 or 2 "most useful" ratings, less "least helpful" ratings).

- Proportion of immunizable communicable disease cases for which patient history reveals past immunization for disease contracted.
- Percentage of mothers giving supplemental foods to infants by age six months.
- Percentage of children under 5 years weighed once, twice, thrice or four or more times during a twelve-month period.
- Percentage of women delivering who had a prenatal contact before the sixth month of gestation.
- Average number of prenatal contacts per pregnancy.
- Percentage of pregnant women receiving delivery care by trained attendants.
- Percentage of newborns with a sibling under 2 years born to the same mother.
- Percentage of children age 2 through 4 years who are fully immunized (requires 3-5 immunization contacts with BCG and with DPT, measles and polio trivalent vaccines).
- Percentage of children, by sex and age groups, who are below the lower line of the normal range on the growth charts.
- Crude birth rate.
- Average annual cost of supporting each: CHW, TBA, Health Centre Worker (by type), Nurse, Physician, Health Centre.

The following indicators were found to have an equal balance between "most useful" and "least helpful" ratings, indicating their management utility in some but not all settings.

- Numbers and proportions of TBAs who are trained.
- Percentage of women, 15-45 years, aware of benefits of: prenatal care; delivery by trained attendant; postnatal care; tetanus immunization for pregnant women before delivery; DPT, polio, measles and BCG immunizations for children; ORT for diarrhoea, by type of ORT; boiling water before consumption; protecting and maintaining clean water sources; using pit latrines and water-seal privies; protecting and covering food; protecting against mosquito bites; measuring weight gain

during pregnancy; measuring weight of newborn; measuring of children periodically and recording weight on growth chart (at least four times yearly); breast-feeding.

- Percentage of mothers breast-feeding babies up to the age of 6 months, 12 months, 18 months, 24 months or longer.

- Percentage of pregnant women who receive antenatal care at least once.

- Percentage of population, by sex/age groups, who regularly use water-seal privies or pit latrines.

- Maternal mortality rate.

- Average service cost to the consumer (or fee, if applicable) of each of the following services by type of provider (TBA, CHW, Health Centre personnel): prenatal visit, delivery, postnatal visit, maternal illness, infant/child illness, well-baby check, growth monitoring, immunization service by type of immunization.

The following indicators received a lower rating on their utility to management decision-making (1 or 2 "least helpful" ratings, less "most useful" ratings).

- Percentage of population within 5 kms or one hour's walk to CHW or other trained health care provider.

- Proportion of patients seen who report successful treatment or improvement in problem following visit to facility/provider.

- Proportion of population who was satisfied with the quality of care provided and who would return to facility/provider for future care.

- Percentage of women, age 15-45 years, aware of available services, such as: maternal and child health, family planning, immunization, medical care services.

- Percentage of children age 12 through 23 months who have received at least one immunization, by immunization type.

- Percentage of children age 2 through 4 years who have received at least one immunization, by immunization type.

- Percentage of households with clean water supply (protected well or water standpoint) within 15 minutes walk from household.

- Percentage of households with safe human waste disposal (pit latrines or water-seal privies) on premises.

- Percentage of households with safe human waste disposal (pit latrine or water-seal privies) within 100 meters or 5 minutes walk.

- Percentage of newborns with low birth weight.

- Annual per capita costs (total costs of all inputs to programme including community, private sector, and government sector sources) for all PHC services divided by: total population; target population; actual beneficiaries.

The following indicators were found to be least useful for management purposes (3 "least helpful" ratings, no "most useful" ratings).

- Percentage of population who sought health care during past year who: found CHW available when service was sought; found health center open when service was sought; found a health care provider available for type of service sought; was able to pay for cost of service.

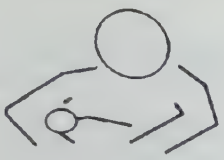
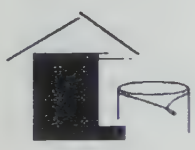
- Volume of water consumed and used per person per day.

- Percentage of households with clean water supply (protected well or water standpoint) on the premises.

- Percentage of population, by age group, who use soap in kitchen, at latrine, when bathing, when washing clothes.

- Proportion of population with one of the following problems, by age and sex groups, who receive appropriate treatment: diarrhoea; malaria; respiratory infection; intestinal worms and parasites; accidents and serious injuries, including those referred; complications of pregnancy, including those referred.

National Economic and Social Development Board, Thailand: Basic Minimum Needs/Quality of Life Indicators for Village Use

	BASIC MINIMUM ELEMENTS	INDICATORS FOR VILLAGE USE
 **Family members consume sufficient nutritious and safe food.**	Infants and pre-school children (from birth to five years of age) are under nutrition surveillance and free of dangerous malnutrition.	◦ Weight and height for age.
	Children from 5-14 years of age receive all necessary nutrients.	◦ Weight and height for age.
	Pregnant women have adequate and correct food intake.	◦ Infant birth weight is not less than 3,000 grams.
	Families eat nutritious and safe foods.	◦ People do not have severe cases of diarrhoea or malnutrition.
 **Every family has appropriate shelter and environmental conditions.**	Houses are made of durable materials.	◦ Houses are made of materials of not less than five years durability.
	Family houses are kept clean and orderly.	◦ House interior is clean and the vicinity is kept orderly with a garbage container and no stagnant or dirty water.
	Family has use of a sanitary latrine.	◦ Latrine according to sanitary standards.
	People in the family have safe drinking water -- two litres/person/day (rain water, filtered water, piped water, pond water).	▫ Sufficient safe drinking water -- two litres/person/day.
People have the opportunity to receive those basic social services which are necessary for maintaining life and occupation.	Children and youth have the opportunity to receive basic social services.	◦ Children under one year receive vaccination against pertussis, tuberculosis, tetanus, diptheria, polio, and measles. ◦ Children and youth have the opportunity to receive compulsory education. ▫ Primary school children receive vaccination against tetanus, typhoid, pertussis, and tuberculosis boosters. ◦ People over twelve years of age are literate.
	People have the opportunity to receive basic social and occupational services.	◦ People have adequate information on occupation, prevention of disasters and consumer protection.
	Pregnant women are looked after.	◦ Pregnant women are vaccinated for tetanus, are checked four times before giving birth and receive birthing services and a check up within six weeks after giving birth from a government worker or a trained traditional midwife.
People have security in their lives possessions.	People are safe from thieves.	◦ There is no theft, rape, crime or bodily harm committed. ◦ Traveling about late at night is safe.

	BASIC MINIMUM ELEMENTS	INDICATORS FOR VILLAGE USE
People have efficient production and procurement of food.	People perform agricultural activities according to appropriate methods.	◦ Adjustments in the soil are made for raising plants and animals (i.e., crop rotation, protection against soil erosion, adjustment of acid soil). ◦ Good species of plants and breeds of animals are used. ◦ Chemical fertilizer which is appropriate for the soil and plants, and organic fertilizer for soil adjustment are used. ◦ Protective measures against harmful plant insects and animal and plant diseases, are used. ◦ The people raise, treat, and reproduce animals.
Families are able to plan the spacing and number of children.	Couples have not more than two children and are able to choose and practice more than one method of birth conrol.	◦ Couples have not more than two children and are able to choose and practice more than one method of birth control.
People participate in developing their own and their community's way of life.	People participate in developing their standard of living in economic, social, cultural and environmental areas.	◦ People are members of groups in order to assist in improving economic and social conditions. ◦ Each person participates in the development of himself and of his/her community. ◦ People participate in supporting and keeping public property including that built by the government and community, and also natural facilities. ◦ People participate in supporting and keeping cultural treasures in an appropriate condition. ◦ People participate in taking care of natural resources.
	People participate in determining their way of life.	◦ People use their right to vote for subdistrict leader representative to subdistrict council, village leader and village committee. ◦ People are able to draw up a plan, implement the plan and establish a system to maintain the work results by themselves.
People have spiritual development values.	People live their lives according to religious principles.	◦ Absence of addiction to alcohol, gambling, or severely addictive substances. ◦ People participate in activities on important religious days.
	People practice moderation according to their basic values.	◦ There is moderation in these ceremonies according to religious principles and traditions.

PRICOR: PHC Outcome Indicators

This list is taken from tables developed from PRICOR indicators of the knowledge (K), attitudes (A), behavior (B), and "impact" (I) of mothers with children under two years of age. These indicators were used in a baseline study in a province in rural Thailand to assess PHC needs. They could also be modified for use at the community level.

EPI

- Knowledge of vaccine among mothers by district. (K)
- Percentage of mothers who know when to obtain vaccination by district. (K)
- Percentage of children in targeted age group who were immunized and percent of children with immunization card by district. (B)
- Percent of children aged two years and less vaccinated with BCG, DPT 1, 2, 3, OPV 1, 2, 3, and measles by district. (B)
- Cumulative proportion of children aged two years and less vaccinated with BCG, DPT/OPV1, DPT/OPV2, DPT/OPV3 and measles according to schedule by district. (B)
- Proportion of children in targeted age groups vaccinated with BCG, DPT/OPV1, DPT/OPV2, DPT/OPV3 and measles by district (excludes those without immunization cards who could not remember what their child had received). (B)
- Proportion of children in targeted age groups vaccinated with BCG, DPT/OPV1, DPT/OPV2, DPT/OPV3 and measles according to schedule by district. (B)
- Source of vaccine among those whose child has been vaccinated by district. (B)
- Percentage of mothers who can identify type of immunization side effect by district. (K)

ORT

- Percent of mothers who can recognize the signs or symptoms of diarrhoea by district. (K)
- Knowledge of ORT among mothers by district. (K)
- Percentage of mothers whose children aged five years or younger ever had diarrhoea and whether the child was given ORT at home. (B)
- Number of children aged two or younger who had diarrhoea in the past month and number receiving ORT by district. (B)
- Percent of mothers who know about ORS and whose children ever had diarrhoea by district. (B)

MCH

- Percentage of mothers who received prenatal care for the current or last pregnancy and number of prenatal care for women pregnant at time of the survey. (B)
- Frequency of prenatal care services received during the last or current pregnancy by district. (B)
- Percentage of mothers who received tetanus toxoid shot during the last pregnancy by district. (B)
- Source of prenatal care as reported by mothers who ever received prenatal care by district. (B)
- Place of delivery for last birth by district. (B)
- Type of birth attendants for last birth by district. (B)
- Proportion who received postnatal examination and frequency of examinations by district. (B)
- Source of postnatal care among those who received postnatal care by district. (B)

GM/NUT

- Percentage of mothers who heard about growth monitoring program and percentage of those who actually had their child aged two or younger weighed by district. (K)
- Persons who weighed the children under two years for children ever weighed by district. (B)

- Percentage of mothers who had the recorded growth monitoring chart for the youngest child among those who ever had their children weighed by district. (B)
- Percentage of mothers who possessed either recorded or unrecorded growth chart who could interpret or explain child growth curve by district. (K)
- Nutrition status of children aged less than five years based on information from the growth chart among those who had a recorded growth chart by district. (I)
- Percentage of mothers who ever breast fed their youngest child and percent who were currently breastfeeding the child. Age of children under two years when first given supplemental food among those who already gave their child some kind of supplemental food by district. (B)

W&S

- Proportion of mothers in households using rainwater as a major source of drinking water and, of those, the proportion who cover the rainwater collection container and have enough drinking water year round. (B)
- Percentage of mothers in households with selected food sanitation practices. (B)
- Percentage of households with a clean latrine by district. (B)
- Methods of garbage disposal by district. Percentage of households that were constructed over the livestock pen by district. (B)

PARTICIPATION

- Proportion of mothers who thought that the village health volunteers were useful by district. Percentage of mothers who ever sought advice from the village health volunteer for any health related problem by district. (A)
- Percentage of mothers who think that the village health communicators are useful by district. (A)
- Percentage of mothers who reported that there was a nutrition program in their village and the percent who ever received some supplemental food from the program. (K,B)
- Percent of mothers that live in a village with an MOPH drug cooperative fund by district. (B)
- Percentage of mothers who had patronized the drug cooperative among those with an active drug fund in their village. (B)
- Percentage of mothers who belonged to a club/group which supports any kind of health activity by district. (B)
- Health expenditures (BAHT) on certain elements of primary health care by district (excludes those who did not receive the services). (B)

WHO: Global Indicators for Monitoring and Evaluating the Health For All Strategy

The number of countries which:

(1) *Health For All has received endorsement as policy at the highest official level*, e.g., in the form of a declaration of commitment by the head of state; allocation of adequate resources equitably distributed; a high degree of community involvement; and the establishment of a suitable organizational framework and managerial process for national health development.

(2) *Mechanisms for involving people in the implementation of strategies have been formed or strengthened, and are actually functioning,* i.e., active and effective mechanisms exists for people to express demands and needs; representatives of political parties and organized groups such as trade unions, women's organizations, farmers' or other occupational groups are participating actively; and decision-making on health matters is adequately decentralized to the various administrative levels.

(3) *At least 5% of the gross national product is spent on health.*

(4) *A reasonable percentage of the national health expenditure is devoted to local health care,* i.e., first-level contact, including community health care, health centre care, dispensary care and the like, excluding hospitals. The percentage considered "reasonable" will be arrived at through country studies.

(5) *Resources are equitably distributed,* in that the per capita expenditure as well as the staff and facilities devoted to primary health care are similar for various population groups or geographical areas, such as urban and rural areas.

(6) *The number of developing countries with well-defined strategies for health-for-all, accompanied by explicit resource allocations, whose needs for external resources are receiving sustained support from more affluent countries.*

(7) *Primary health care is available to the whole population, with at least the following*:

- safe water in the home or within 15 minutes' walking distance, and adequate sanitary facilities in the home or immediate vicinity;
- immunization against diptheria, tetanus, whooping-cough, measles, poliomyelitis, and tuberculosis;
- local health care, including availability of at least 20 essential drugs, within one hour's walk or travel;
- trained personnel for attending pregnancy and childbirth, and caring for children up to at least one year of age.

(8) *The nutritional status of children is adequate, in that:* at least 90% of children have a weight for age that corresponds to the reference values given in Annex 1 to *Development of Indicators for Monitoring Progress Towards Health for All by the Year 2000.*

(9) *The infant mortality rate for all identifiable subgroups is below 50 per 1000 live births.*

(10) *Life expectancy at birth is over 60 years.*

(11) *The adult literacy rate for both men and women exceeds 70%.*

(12) *The gross national product per head exceeds US $500.*

Microcomputer Software Used By Workshop Participants

APPLICATIONS *(demonstrated)*

- CDC ANTHRO
- "CSDADOS -- An Inexpensive, Elementary and Didactic Microcomputer Applications Generator for Community Health Centres," Dr. Teodoro Briz, NSPH
- DEMPROJ, Population projections based on certain assumptions
- "The Development of a National Microcomputerized Health Information System in Malta," Dr. Paul Fenech Gonzi, MOH/Malta
- EPIINFO
- Expenditure on Drugs: Sensitivity Analysis, Simulation, and Goal Setting -- Demonstrations of ENFIN add-ins to LOTUS
- Forecasting of Health Care -- Demonstration of BFS FORECAST PRO (an expert system)
- Family Planning, Impact and Cost Effectiveness
- The Microcomputerized Management Information System of the Aga Khan Community Health Programme, Dhaka, Dr. Barbara Echols, Ms. Khatidja Husein.
- Microcomputer Simulation in Primary Health Care Programme Planning and Management, Dr. John Bryant, Mr. Arif Rawji, AKU/FHS
- PRICOR/WHO ORT Planning Model (Lotus Symphony)
- Profile, Spreadsheet for PHC Center Resource Management
- WHO, CAP, Computer Assisted Programming -- Targets and Forecasts on Indicators of HFA 2000 Strategy for all European Countries

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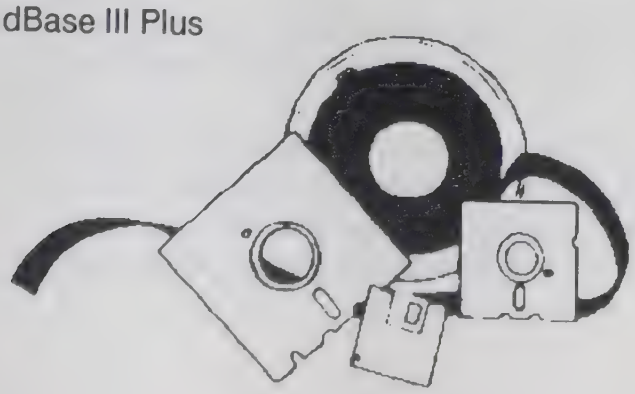
DATABASE *(available for use)*

- dBase III Plus



GRAPHICS & DESKTOP PUBLISHING *(demonstrated and used to produce this document)*

- Xerox Ventura
- Show Partner
- StoryBoard
- Paint Brush
- Assorted Clip Art

PROJECT MANAGEMENT *(demonstration)*

- Harvard Total Project Manager II
- Kepner-Trego, Inc. PLANNING PRO
- TimeLine

RISK ANALYSIS, SIMULATION, SENSITIVITY ANALYSIS, GOAL SETTING, LINEAR PROGRAMMING, FORECASTING *(demonstrated)*

- Prism Risk Analysis and Simulation System
- ENFIN Software Corp., Optimal Solutions (Lotus add-in)
- ENFIN Software Corp., Simulated Solutions (Lotus add-in)
- ENFIN Software Corp., Goal Solutions (Lotus add-in)
- ENFIN Software Corp., Impact Solutions (Lotus add-in)
- BestChoice, Sterling Castle Software, decision utility
- BFS, Forecast Pro, expert forecasting utility

SPREADSHEET *(available for use)*

- Symphony
- Lotus 1-2-3

WORD PROCESSING *(available for use)*

- WordStar
- MultiMate Advantage

Glossary

COMMUNITY HEALTH WORKER (CHW)

A person indigenous to the community who has been trained to provide basic preventive and curative health services to members of the community and to work with other trained health workers as a team. Also called village health workers. These include promotors, community health auxiliaries, health agents, health guides, health visitors, among others.

COST(S)

The value of a good or service, which is conceptually defined as the value that could be gained by using the resources in a different way. For example, the cost of drugs could be seen as the value of using the resources to purchase some other commodity or service.

- *Average Cost(s)* -- The mean cost per unit of outcome, computed by dividing the total cost by the number of units of outcome; also called unit cost.
- *Capital Cost(s)* -- Costs of items which have a life expectancy of one year or more, usually land, buildings, vehicles, and equipment.
- *Direct Cost(s)* -- Costs that are directly attributable to a programme, project, or activity, such as the cost of gasoline used by project vehicles for project work.
- *Fixed Cost(s)* -- Costs that do not vary with the level of programme activity, such as staff salaries.
- *Indirect Cost(s)* -- Costs that are not directly attributable to a programme, project, or activity, but which are incurred in support of it, such as the cost of fuel to heat a cafeteria where project staff sometimes eat.
- *Marginal Cost(s)* -- The increased (or decreased) cost of providing one additional (or less) unit of outcome.
- *Recurrent Cost(s)* -- Costs of items that are purchased and used (or replaced) within a period of one year or less, such as personnel salaries, medicine and supplies, gasoline, and utilities.
- *Variable Cost(s)* -- Costs that vary with the level of programme activity, such as drugs, gasoline, and vehicle maintenance.

COST-BENEFIT ANALYSIS

A technique for comparing the costs and the monetary values of alternative ways of achieving the same objective.

COST-EFFECTIVENESS

A technique for comparing the costs and effectiveness of alternative ways of achieving the same objective.

DELPHI

A technique for obtaining information and arriving at a consensus -- usually in writing -- from a group of knowledgeable persons in response to a given question or defined set of conditions.

EXPERT INFORMANTS

Those chosen to respond in a Delphi exercise.

FOCUS GROUPS

A method of data collection using open-ended group interviews.

INDICATORS

Variables which help to measure changes.

INFORMATION AUDIT

An analysis of information use at all levels of management. Focuses on how data is utlized to make decisions and allocate resources.

MANAGEMENT INFORMATION SYSTEM (MIS)

The collection and production of information useful to managers (such as health status indices, health service activity, population covered by services, supplies consumed, status of inventories, accounts payable and receivable) for programme/project planning and monitoring.

MODEL

A simplified representation of real or hypothetical relationships.

SENSITIVITY ANALYSIS

An analysis that shows how a solution is affected by changes in one or more of the variables that influence its value.

SIMULATION

A technique for reproducing or representing under test conditions phenomena likely to occur in actual performance.

SPECIAL STUDIES

Studies that are different from what is ordinary or usual. Commonly applied in the health field to surveys, primary health care reviews, censuses, expert informants, and focus groups. May also include special analyses of record based information which are not done routinely.

SURVEILLANCE

A method for collecting data by direct observation.

Back Cover Photo: A young, well nourished and active girl in Karnataka State, India, personifies the outcome of a well-managed community-based health care programme which has met her basic minimum needs and helped establish a satisfying quality of life. (Photo by Jean-Luc Ray, Aga Khan Foundation)